

THE MICRO USER

Volume 3
Number 7
September 1985
£1.25



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review

Top-selling guide to the BBC Micro!

**We reveal the
hidden potential
within the B+**

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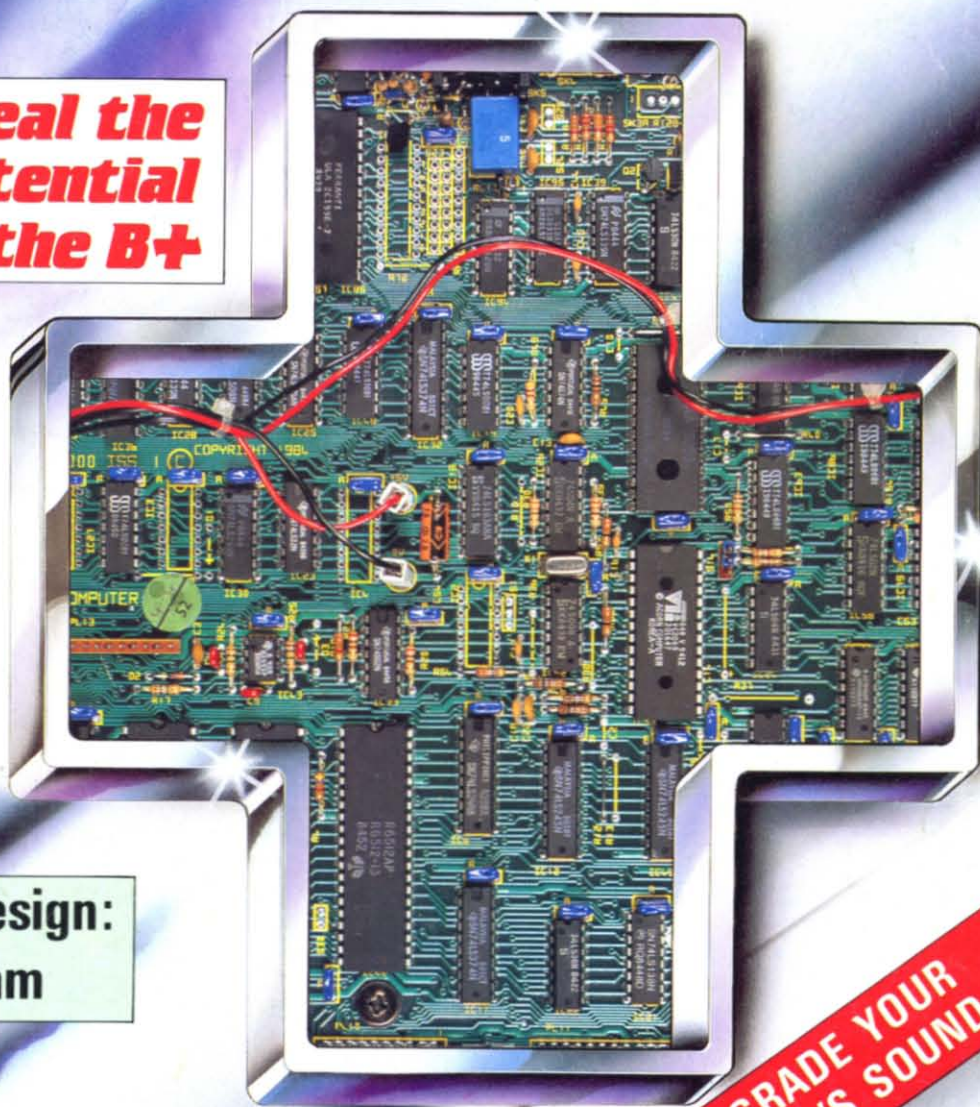
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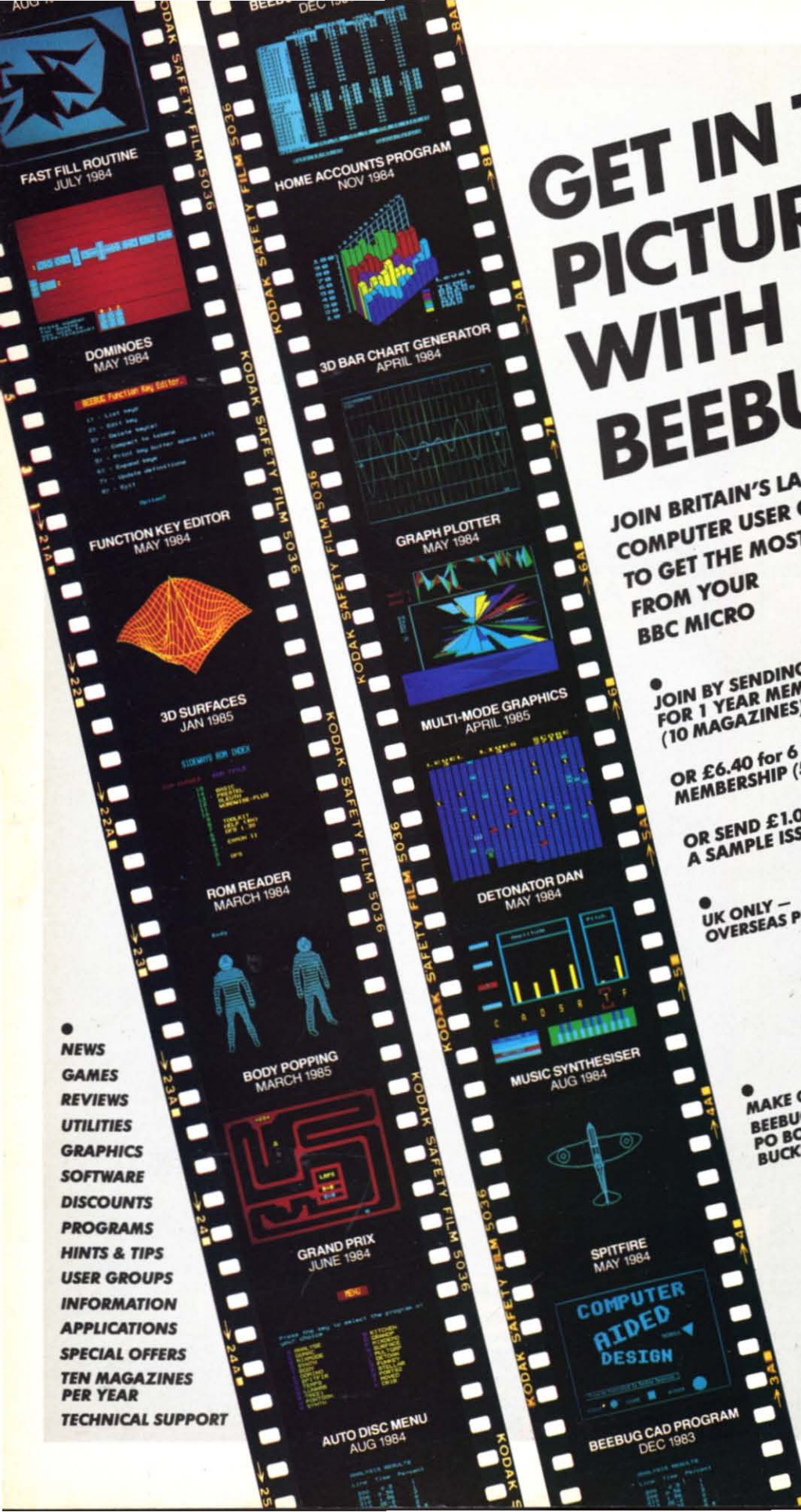
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July-December 1984

The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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The final part of our comprehensive teach-in on the BBC Micro's error handling routines.

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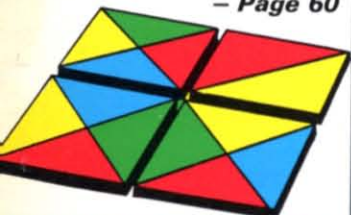
ORDER FORM

From back issues to binders, cassettes to cases, discs to dust covers – they're all here.



The mad professor's released ball lightning in the laboratory. Have you the skill to tame it?

– Page 60

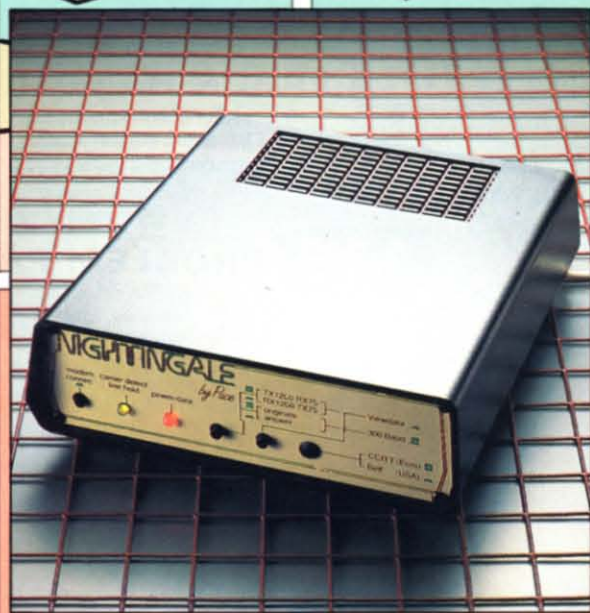


Can you match the colours for points? A game of skill and logic for one or two players.

– Page 112



NIGHTINGALE - THE MODEM



The Nightingale modem is now established as the most popular multi-baud rate modem in its class. Nightingale lets you get on with the job. Whether you need to extract information from Prestel[®], send telexes via Telecom Gold, download telesoftware or simply swap files with a colleague. Did you know that you can search British Library records through their on-line system BLAISE, or access your bank account through homebanking services. The possibilities are endless.

Nightingale operates at the two most popular baud rates, 1200/75 as used by both private and public viewdata systems, and 300/300 baud for communication with remote mainframe, mini or micro systems. Also included is 'reverse viewdata mode', 75/1200 and an optional auto answer/auto-dial board.

Approved for use in the UK and several other countries, Nightingale can be supplied with quality software for a variety of the most popular micros. If you own or use any micro with a standard RS232 interface, including the BBC micro, IBM PC, Apricot, Sirius or an Apple //e, //c or Macintosh, etc, then we may be able to help you.

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New Computer Games For Solidisk Sideways RAM

SOLIDISK's SIDEWAYS RAM is an almost indispensable add-on for the BBC user.

It is available in either 32k, 64k or 128k byte capacity and is compatible with all issues of BBC microcomputers along with most of the add-ons and ROMs obtainable for it.

To date, more than 40,000 units have been sold.

The sideways RAM occupies the right most ROM socket of the BBC and sits in the same position in the micro's memory map as the paged ROMs.

This means that the Sideways RAM can run almost all ROM type software including languages, utilities and filing systems.

The difference between Sideways RAM and Sideways ROM is that RAM can be written to meaning that only the presently required software has to be loaded into the machine, thus making redundant the multitude of high current consumption and often unsightly ROM extension boards.

Sideways RAM is also an invaluable tool for writing ROM type software to run on the BBC since software may be assembled straight into the area in which the final version will run.

For the user who is not interested in writing ROM type software but is in need of the utilities provided by the use of the Sideways RAM, we supply free software to make maximum use of the Sideways RAM facilities.

These are included in the Sideways RAM Software package, a collection of no less than 5 diskettes containing nearly 100 programs, from database, word processor, music system, sprite graphic, printer buffer, virtual memory, spelling checker, RAM disk, RAM filing system, VDU replay, disassembler, machine code monitor, macro basic, video digitised pictures etc... and Solidisk Most Advanced Disk filing System version 2.0.

Another extremely interesting use is to run Solidisk 'Megagames'. They are too large for the non expanded BBC computer, as they make use of high resolution 8 colour (mode 2) screen, background music, sound and sprites at the same time.

Around 70 megagames are planned for release in 5 Megagames Packs at the official Acorn Show (25-28 July 85). Each Pack consists of 5 diskettes, available in either 40 or 80 tracks.

PRICES

The listed price comprises the Sideways RAM fully guaranteed for 1 year, comprehensive manual and software pack 1 consisting of 5 diskettes formatted either in 40 or 80 tracks.

- SWR32 + 5 discs (32k unit, by far the most popular): £58.00
- SWR64 + 5 discs (64k unit, new introduction model): £85.00
- SWR128 + 5 discs (128k unit, the second most popular): £135.00
- Any Extra Software Pack (5 discs): £10.00. Specify 40 or 80 tracks.

As Solidisk Software Support Service has to produce in excess of 25,000 diskettes every month, we regret that we can no longer provide personalised service for disk washing. In extreme cases, when you need to update your software diskette, either reorder a new software package (which is always sold to you at nominal media cost i.e. £10.00 for 5 disks, including new manual, post and packing) or return the old package with £2.00 to cover post and packing costs if you call at Solidisk's stand at any BBC micro exhibition or at the Solidisk office.

UPGRADING

Upgrading from a smaller model is very simple: you return the old RAM board to us with your payment for the difference.

The listed prices include new manuals when necessary.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

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SWR 64			£50	
SWR128				£60

SOFTWARE PACK 1 (included with SWR)

The Software package comprises 5 diskettes, formatted either in 40 or 80 track. Please specify when ordering.

Volume 1:

Volume 1 contains all the general applications of Sideways RAM. Menu, Printer Buffer, STL DFS 2.0, STL E00, RAMDISK, RFS (ROM generator), Fast Backup, Quickcopy, Index etc...

Volume 2:

Volume 2 contains the Solidisk Wordprocessor, Spelling Checker and the English Dictionary.

Volume 3:

Volume 3 contains the Solidisk Macro Basic (a program generator), a Linker-Editor, VMP the Virtual Memory Program, Sigen, a program to create your own dictionary and a sample French dictionary.

Volume 4:

Volume 4 contains the Solidisk Database.

Volume 5:

Volume 5 contains the Solidisk Sprites System.

SOFTWARE PACK 2 (optional)

Volume 6:

Volume 6 contains the Solidisk Spreadsheet.

Menu driven with standard options to create, edit, recalculate, print, search, sort, report generator and mailmerge.

Unlimited number of rows and columns. Each column can be as small as 2 or as big as 70 characters. All math functions are supported. Complete with home banking and simple portfolio management.

Volume 7:

Volume 7 contains Solidisk Play Tunes System and lots of tunes and write music using ordinary ABCD notation.

Volume 8:

STL Toolkit has 24 star commands (Status, Rwipe, Check, Find, Search and Replace, Mode 8, Join, Keyload, LVAR, Salvage, Expand, Edit etc...). STL SFX is Solidisk screen effects utility. In mode 2, you can scale, move, reverse, mirror etc with superlative ease.

VDURECORDER is another screen aid utility. It remembers everything sent to the screen. When you want it, *REPLAY will show it all over again but with an incredible speed.

Solimon is a machine code monitor for both 6502 and 65C02.

Volume 9:

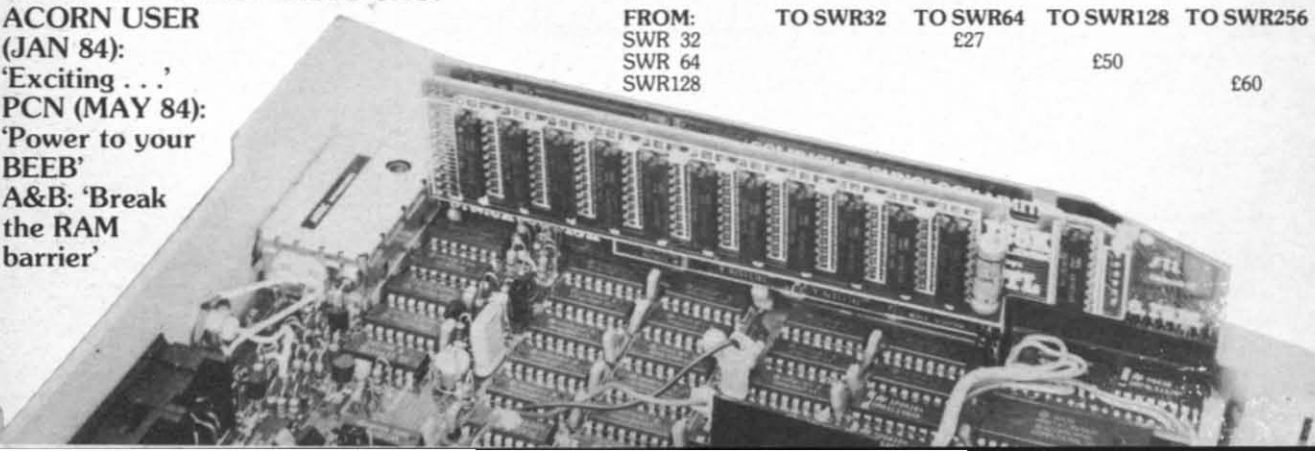
Volume 9 contains the STL ADFS and disc utilities (see next page).

Volume 10:

Volume 10 contains the Solidisk Teletext Editor.

Megagame Packs:

Around 70 games are currently under compilation.



You Only Fit Disks Once. Fit the Best.

The SOLIDISK Double Density DFS is now the ultimate in reliability with a minimum component count and excellent software. The DDFS consists of only 4 components to be plugged in to the BBC Microcomputer and can be fitted in just a few minutes by novice and expert alike. It can now run all Acornsoft games (such as Elite, Aviator, Revs, Magic Mushrooms etc...) and most other protected discs (Castle Quest, Island's Music system etc...)

SOLIDISK relies on a good product and a large support network to win the heart of the user.

With over 75 local experts, covering England, Scotland and Wales, a SOLIDISK National User Group in Holland and soon in Australia, SOLIDISK can offer many users regional free fitting and advice. Also with an ever increasing catalogue of free software, available to all SOLIDISK users.

Even users who are new to the Disc System can expect to build up a large disc program library in a fairly short time.

Solidisk Software Support Service now has a responsibility for over 50,000 users and the ability to give you the best possible support matched only by the largest companies.

WHICH DFS DO YOU NEED?

SOLIDISK produce no less than three types of Disc Filing Systems to cover all your requirements.

1. THE FLEXIBLE DDFS

The basic SOLIDISK DDFS is suitable for all ordinary users.

The 1.9 ROM handles both single and double density formats, with built in disc formatter and verifier, along with such features as automatic density sensing and 40/80 track software controlled switching. The disc speed is programmable by the keyboard links to suit almost any type of disc drive.

The 1.9 ROM supports also file size up to disc size.

PRICE

The STL DDFS with 1.9 ROM£40.00
The STL DDFS with 2.0 ROM£45.00
The STL DDFS with 2.1 ADFS£55.00



2. THE DFDC TO UPGRADE ACORN DFS:

Ideally suitable if you already have an Acorn DFS. The DFDC will not only add Double Density capability but also improve the speed of your 8271 chip.

The SOLIDISK DFDC (Dual Floppy Disc Controllers) is making a very large impact on the BBC user community with its versatility.

The DFDC board simply sits in the place of the 8271 FDC chip (i.e. 78) in the BBC. The 8271 is then inserted into the DFDC board and the ROM 2.0 inserted in place of the original DFS ROM.

Once the machine is up and running it is then simplicity itself to change FDC's; just throw the switch attached to the DFDC board, press BREAK and the other FDC is now selected.

PRICE

The STL DFDC with 2.0 ROM£55.00
The STL DFDC with 2.1 ADFS£65.00

THE SOLIDISK WINCHESTER DISC SYSTEM (XD20-40)

This most powerful Winchester system for the BBC computer to date plugs straight into the 1Mhz bus in a few seconds.

Based around the WD1002 SHD controller, Mitsubishi Winchester drive, Astec PSU and the Solidisk ADFS 2.1, it offers 20 Megabytes (26 MB unformatted) and can easily be upgraded to a theoretical maximum of 1300 Gigabytes.

Its phenomenal capacity, huge potential and excellent features make the most expensive Winchester systems look green.

On the technical side, it has very fast seek and an exceptionally low skew factor of 11 (meaning 3 sectors are read or written in one single revolution). It gets ready very quickly too, needing only a few seconds from power up.

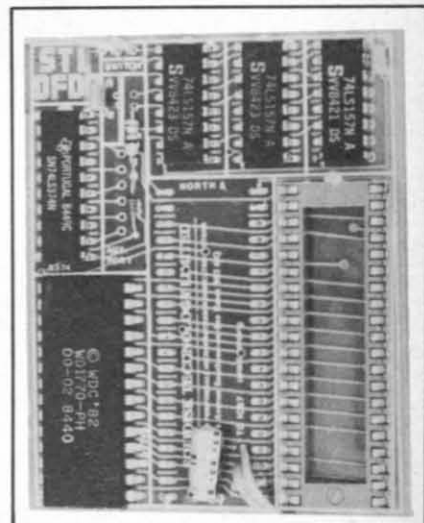
Unlike many other sources of Winchester disc drives, Solidisk Winchester system is properly driven by the Solidisk ADFS 2.1 ROM, compatible with Acorn Winchester specifications and with Acornsoft View, Viewsheet and Viewstore database.

It also runs Gemini's Datagem and Acorn second processors.

It has nice features such as read after write, Password protection, Automatic Winchester to Winchester and Winchester to floppies Backup facilities and a fantastic average file transfer speed of 64k bytes per second.

PRICE:

20 MB Winchester (excluding VAT)£700.00
30 MB Winchester (excluding VAT)£900.00
40 MB Winchester (excluding VAT)£1100.00
60 MB Winchester (excluding VAT)£1300.00



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YOU SHOULD KNOW ABOUT ADFS AND USE IT

ANNOUNCING THE SOLIDISK ADFS 2.1

What is important on a Disc Filing System is how effectively it uses the disc, how fast it loads the programs, how many entries are on the disc and how big they are.

The old BBC DFS leaves most 80 track discs half empty on side 0 and wastes side 2 of most double sided discs.

The new ADFS treats side 0 and side two (if available) as a single disc and uses them to the full.

The old BBC DFS uses single density, the ADFS double density which is twice as fast and stores twice as much.

The old BBC DFS can only handle 31 files of less than 256k bytes in size.

The ADFS can handle thousands of files, up to 600 Gigabytes in size!

If you are afraid that the ADFS is complicated to learn, don't be put off. It isn't complicated at all.

Most of the commands are the same in both systems and the ADFS ones are very much intuitive.

If you know the BBC DFS, a few hours are all you need to master the new ADFS.

You won't regret it. After all, each ADFS disc saves you £2.00 or more on media cost, and the ADFS ROM will pay for itself in a few days.

The Solidisk Advanced Disk Filing System for the BBC computer is now available for both Solidisk DFS and Acorn BBC Plus users.

This massive piece of software is supplied on two 16k ROMs for the BBC B computers or on a 32k ROM for the BBC Plus computers. It supports both the old BBC DFS and the Acorn ADFS. It also provides the users with 20 extra disc utilities.

Standard features for both implementations include:

1) Automatic Write Error Correction.

Every disk write operation is automatically followed by a read operation to ensure that the recorded data is free of all errors. Then if need be, the STL ADFS 2.1 will restart the write operation from the unsafe sector.

2) Automatic 40/80 track stepping.

The STL ADFS will let you read and write 40 track discs on an 80 track drive and copy over from any format to any other format.

3) Disc repair facilities.

Disc sector editor (*DZAP), memory editor (*MZAP), recover good sectors (*RECOVER), rewrite multiple sectors (*RESTORE), read bad sectors and bad track (*RTRACK), repair and restore bad sectors and track (*WTRACK) and the

powerful disc copy (*DCOPY) which is capable of duplicating even some non BBC discs.

4) Tape to disc facilities.

Direct transfer from tapes to disc (*TAPEDISC) will work with all unprotected programs. *TAPELOAD and *TAPESAVE will cope with more difficult ones. Only in some cases (multipart games cassettes) will you need Solidisk tape copier.

5) Wordprocessing facilities.

This facility allows IBOOT and other text files to be edited, saved and printed in any screen mode.

6) automatic disc sensing.

On Shift Break, the STL ADFS will automatically detect the disc format and use the right disc filing system to run it.

Special features for the ADFS implementation:

1) Disc formatting facilities.

*FORM40, *FORM80, *FORM160 and *WFORM (for the Winchester) allow you to format ADFS discs in any drive.

2) Disc verifying facilities.

*VERIFY will check all disc sizes including Winchester for media defects.

3) Number of opened channels.

This is one of the star features of Solidisk ADFS.

This facility (*OPEN) allows you to specify how many files will be opened in a program, thus maximising the available RAM while avoiding buffer page swapping as in the Acorn ADFS.

It leaves PAGE at &1900 for most programs, gives extra memory to View and Viewsheets and also avoids unnecessary conversion work on programs originated for the BBC DFS.

Special features for the BBC DFS implementation.

Solidisk ADFS 2.1 handles both single and double density. In addition, it supports:

1) Unlimited catalogue entries (up to disc capacity) without any preparation.

2) Unlimited filesize.

3) Automatic media detection.

8) PRICE

2.1 ROM set £20.00

Upgrade from 1.9 £15.00

Upgrade from 2.0 £10.00

SOLIDISK KEYBOARD AND CPU

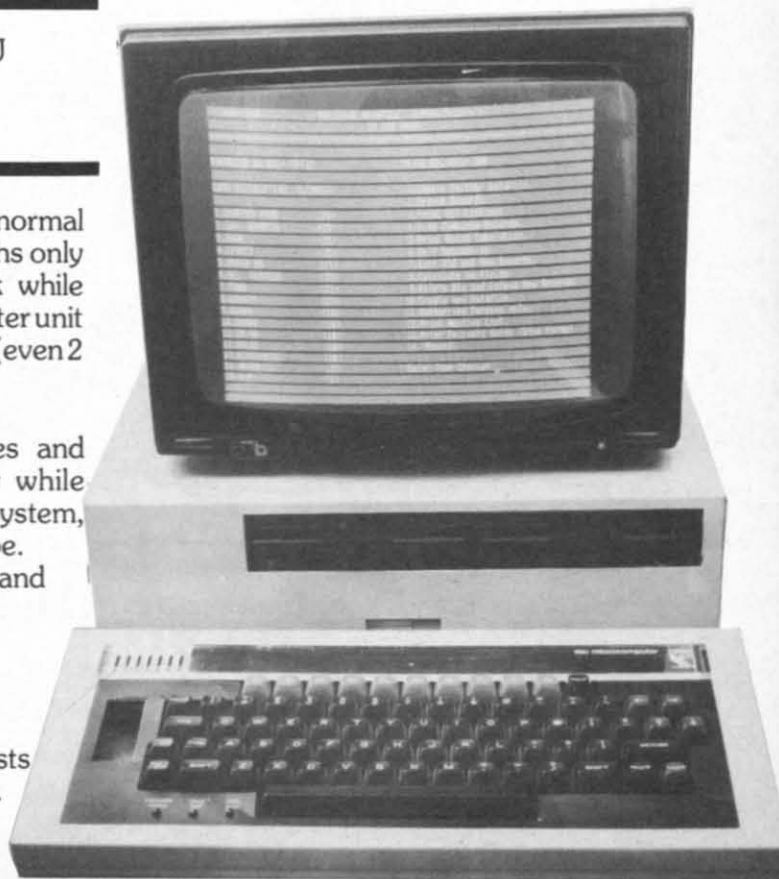
ARE NOT JUST PRETTY...

The keyboard is 12 mm lower than the normal BBC case, 2-3 degrees more angled, weighs only 5lbs, does not skid about on the desk while enjoying 2 feet of freedom from the computer unit — and makes a lot of difference to typists (even 2 fingered ones!).

The CPU accommodates 2 disk drives and withstands any heavy weight monitor while providing easy attachment for the whole system, CPU and disk drives, to the desk if need be. Good ventilation to the power supply too and hides all untidy cables away.

PRICE

The complete CPU and keyboard case costs £30.000 inclusive + £3.00 post and packing. The system could be yours free as part of the Mitsubishi twin discs offer.



SOLIDISK MITSUBISHI DISC OFFER

A Complete Disc System containing everything you need, including 1 Blank Diskette, at a new low price of only £199.00 inclusive.

The Mitsubishi Offer Comprises:

- One Mitsubishi MF4853, Double Sided, 80 Track Disc Drive. Cased in beige with all leads.
- One Solidisk DDFS complete Disc Upgrade with 2.0 ROM.
- 1 Verbatim MD525 Blank Diskette.
- 1 Software Pack and User Manuals.
- Full one year guarantee.

PRICE: 200.00.

HARDWARE:

As described earlier as shown opposite.

THE SOFTWARE:

The software comprises 5 diskettes, formatted in 80 tracks.

Volume 1:

Solidisk Word Processor and Spelling checker with English dictionary. Easier than View, Wordwise or Scribe, you enter the WP by *WP filename, then start typing. What you see on the screen will be exactly printed on paper.

Most useful commands are all displayed on the top part of the screen.

It features 80 column screen throughout with direct on screen justification, automatic margins, page numbering, Wordstar like editing commands for block move, block delete, block copy, print, save, load text to

cursor, insert and overwrite, search and replace, total word count, word frequency count, free space, *commands etc. Solidisk WP loads and saves texts in under 1 second flat and also you may save the edited version as many times and under any filename you like.

It has the unusual ability to spellcheck your document without leaving it, simply by typing in Control-U.

It has self dictionary generating capability too. You may create any dictionary you like by just simply entering the words.

Solidisk WP is also excellent as secretarial training for Wordstar.

Volume 2:

Volume 2 contains Solidisk Database. It is a random access system, completely menu driven and easily customised to suit any particular filing need.

It features unlimited filesize and number of records, supports all maths functions and 80 column screen throughout.

It is simple to understand and to use. You take one of the 15 different options to start. Each option will then lead to a new menu and so on. Mostly you only have to enter an appropriate data or hit the RETURN key.

You can design new databases list all records, edit them, merge them, split them, making mailshot with Solidisk WP etc. . . We use it to process all your orders.

Volume 3:

Volume 3 contains Solidisk Spreadsheet. Menu driven with standard options to create, edit, recalculate, print, search, sort, report generator and mailmerge.

Unlimited number of rows and columns. Each column can be as small as 2 or as big as 70 characters. All math functions are supported. Complete with home banking and simple portfolio management.

Volume 4:

Volume 4 contains the Solidisk tape to disc program and a selection of computer games.

Volume 5:

Volume 5 contains MBASIC, SIGEN and other disc utilities.



IMPORTANT:

If you upgrade to a twin Mitsubishi disc system, Solidisk will offer you, subject to stock availability, a completely free set of CPU and keyboard case as shown earlier.

You should return your disc drive with payment for another Mitsubishi MF4853 (£160.00) or alternatively, save by ordering right now a Fantastic Offer at only £340.00.

SOLIDISK LOCAL EXPERTS

We have people able to fit your equipment free of charge in all of the following towns. If your area is not mentioned, ring the office!

Dunstable, Leighton Buzzard, Reading, Peterborough, Penzance, Torquay, Wimborne, Basildon, Stroud, Southampton, Hoddesdon, Watford, Bexley, Margate, Rochdale, Boston, London (all areas), Oldham, Hunts Cross, East Dereham, Rushden, West Bridgford, Wantage, Bambury, Grimsby, Kingston, New Malden, Woking, Taunton, King Norton, Sutton Coldfield, Halesowen, Leamington Spa, Hassocks, Salisbury, Swallowne, Leeds, Huddersfield, Treowen Newtown, Newtownards, Co Fermanagh, Co Londonderry, Le Mesnil St Denis (France), Kalgoolie (Australia), Paramatta (New Sth Wales), Manawatu (New Zealand).

Short form price list.

Qty Items.	Prices	P&P			
For the BBC B:			SWR256+	£190.00	£1.00
Sideways RAMs:			640k Disc Offer	£200.00	£3.00
SWR32	£58.00	£1.00	1.3MB Fantastic Offer	£340.00	£5.00
SWR64	£85.00	£1.00	Winchester Units same as above.		
SWR128	£135.00	£1.00			
CPU & Keyboard			For the ELECTRON:		
Case (both)	£30.00	£3.00	EFS	£59.00	£1.00
Solidisk DDFS.			Special Disc Offer	£200.00	£3.00
DDFS (with 1.9 ROM)	£40.00	£1.00	Winchester Units same as above.		
DDFS (with 2.0 ROM)	£45.00	£1.00			
DDFS (with 2.1 ROM)	£55.00	£1.00	Eprom Equipment		
DFDC (with 2.0 ROM)	£55.00	£1.00	Programmer	£20.00	£1.00
DFDC (with 2.1 ROM)	£65.00	£1.00	Eraser	£20.00	£1.00
Special Offers.			2764 × 5 new low price	£24.00	£1.00
640k Disc Offer	£200.00	£3.00	27128 × 3 new low price	£24.00	£1.00
1.3MB Fantastic Offer	£340.00	£5.00	Datalife Diskettes		
20MB Winchester	£805.00	£12.00	MD525 SS/DD	£17.00	£1.00
30MB Winchester	£1035.00	£12.00	MD557 2S/4D	£28.00	£1.00
40MB Winchester	£1265.00	£12.00	3.5" Datalife	£35.00	£1.00
60MB Winchester	£1495.00	£12.00	Misc.		
For the BBC PLUS:			65C02 with Software	£13.00	£1.00
SWR16+	£58.00	£1.00	Solimon-2 16k ROM	£13.00	£1.00
SWR64+	£85.00	£1.00	2.0 DFS 16k ROM	£15.00	£1.00
SWR128+	£135.00	£1.00	2.1 ADFS 32k ROM	£20.00	£1.00

Total =

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Barclay/Access: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

We reserve the right to change prices and specifications for improvement without notice.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).



Herbie Briggs has just destroyed the myth that all floppy discs are created equal.

They seem equal. Until you look at the seams.

That's where equality ends.

Most companies seal their discs with a spot here, a spot there. Leaving most of each seam not sealed at all.

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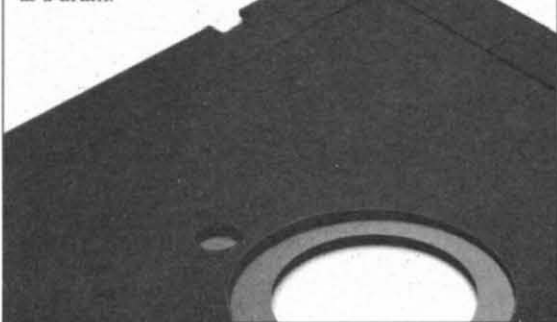
Solid-Seam Bonding seals shut every inch of every seam of every Memorex® floppy disc. Tight as a drum. That makes the Memorex

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To resist bulging, warping, puckering, or opening up.

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Every inch of every seam is sealed shut. Tight as a drum.



To resist all the things that can jam your drive, ruin your drive head, or lose your data.

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Solid-Seam Bonding is just one example of the extra care that goes into every Memorex floppy disc. Be it 8", 5¼" or the new 3½". Extra care that lets us guarantee every Memorex disc to be 100% error-free.

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It's always better to be safe than sloppy.

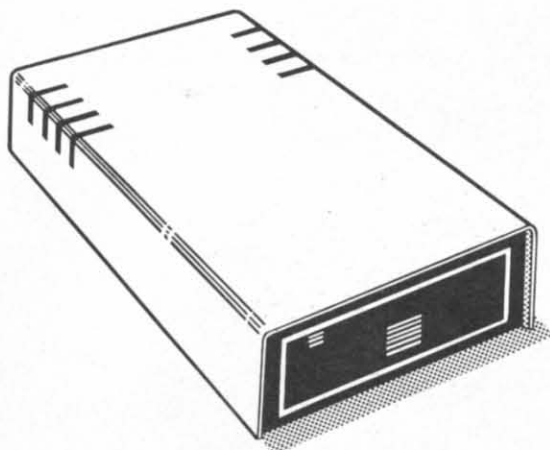
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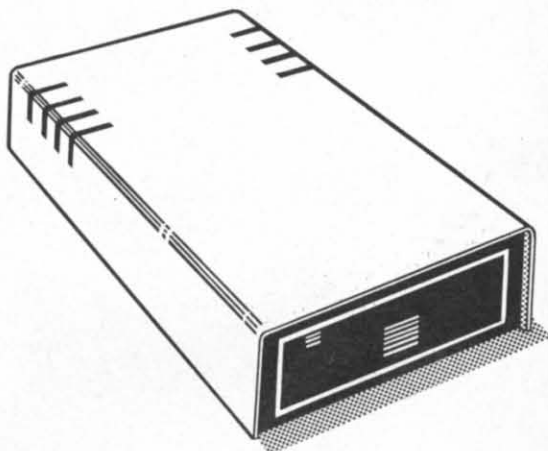
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200K (400K DOUBLE DENSITY)
40 Track Double Sided
6ms TK to TK
Access, Head Load Solenoid
DIRECT DRIVE

£75.00 INC
While stocks last

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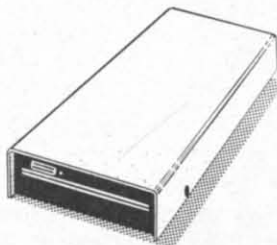
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40/80 track switchable with dual colour lead
400K (800K in double density)
3ms Access in 80 Track Mode
Head Load Solenoid,
DIRECT DRIVE

£119.00 INC
Dual with P.S.U. £224.00 INC



221A Super Slim
40/80 Track Switchable
with dual colour L.E.D.
400K (800K in Double Density)

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Dual with P.S.U. £319.00 INC



211A Super Slim
40 track Double Sided
200K (400K Double Density)

£89.00 INC
Dual with P.S.U. £219.00 INC

Price includes Drive Cased with Cables Manual and Utilities Disc

THE SCYTHER TOOLKIT

If you can't see the wood for the trees, get the SCYTHER and HACK your way through!! This ROM contains loads of useful commands and has the added bonus of accepting both HEX & DECIMAL entry.

MDIS: A fast UP/DOWN scrolling dissembler which will examine all paged ROM's. Will work in any 40 or 80 column mode.

SDIS: Will spool disassembled code in a form compatible with the BASIC2 assembler, data is represented with EQU's.

MERIT: Memory editor with hex/ascii display, UP/DOWN scrolling with paged ROM/RAM access. Will work in any 40 or 80 column mode.

KLIST: Expands soft key definitions and presents them so they can be easily edited, all codes are expanded so that wordwise type definitions can be changed.

BASE: Will accept a number and display its HEX, DECIMAL & BINARY equivalents.

ROMLIST: Displays what ROMs are present in your machine and the ROM size.

ROMSAVE: Will save any sideways ROM to the current filing system.

FORMAT: Formats a disk to any number of tracks.

VERIFY: Verifies a disk shows up bad tracks, and displays an error count.

FREE: Displays an analysis of the free space available on a disk.

SFIND: Search memory for the occurrence of a specified string.

BFIND: Search memory for the occurrence of any sequence of bytes.

XLIST: Will search a BASIC program for any VDU codes (which may for instance be used to make the program unlistable) and replace them.

BAD: Will attempt to repair a bad program.

MRELOC: Will add a relocating program to a machine code file so that it will automatically download and run.

SLOW: Will slow down operation of the BBC (over a variable range) to allow easier playing on many games, and the analysis of the operation of graphics etc.

TDISK: Comprehensive file transfer utility allowing you to transfer files between filing systems (ROM, NET, DISK, TAPE). Many features including locking/unlocking programs, can handle any length of file, most forms of tape protection copied with.

VECTOR: Will produce a menu of the programs on a VECTOR1 program disk, and run them, this utility will cope with some forms of protection which cannot be handled by any disk based product.

£24 including P&P & VAT ▲

DIAGRAM

A program which allows you to store very large diagrams—up to 39 mode 0 screens—and view or edit them by SCROLLING the computer screen around over any part of the diagram.

FEATURES

- Draw diagrams, schematics, plans etc, in any aspect ratio, e.g. 10*3, 2*12 screens.
- Access any part of the diagram rapidly by entering an index name, e.g. TR6,R5 etc, to display a specific section of the diagram, and then scroll around to any other part of the diagram using the cursor keys.
- Up to 128 icons may be predefined for each diagram e.g. Transistors, resistors etc, in full mode 0 definition, up to 32 pixels horizontally by 24 vertically.
- Hard copy printouts in varying print sizes up to 9 mode 0 screens on an A4 size sheet, compatible with most dot matrix printers.
- Many other features including, selectable display colours, comprehensive line drawing facilities, TAB settings, etc.
- Disc contains sample diagrams and two versions of the program, one of which will work from a 16k sideways RAM.
- Comprehensive instruction manual.

£28.75 Including P&P & VAT Supplied only on disc—40T/80T compatible

DISCUS ►

Test utility for testing your own disc drive, at regular intervals to avoid the dreaded flop of your floppy. Menu driven, easy to use, 40 or 80 track versions.



TESTS: Motor speed, read/write, step test, alignment test, *, step & read/write test, read only test.

£8.00 inc £7.00 if purchased with disc drive.

*This test requires an oscilloscope & alignment disc.

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Vector 1—

The ultimate tape to disk utility Vector 1 allows you to transfer almost all your tape software to disk. Unlike others, you only need to buy 1 copy of Vector 1 since it transfers tapes to specially formatted program discs. This is easily the most powerful tape to disk utility available.



VECTOR 1 & 2

Vector 2—Disk to disk utility

Vector 2 allows you to make backup copies of all your valuable disk software. It is the most advanced utility of its kind available.

It is a condition of sale that neither of these products are used for infringement of the copyright.

Vector 1 £16 On its own

£15 if purchased with disk drive

Vector 2 £16 On its own

£15 if purchased with disk drive

Vector 1 & 2 £30

EPROMS

2764 £3.00

28128 £5.00

Inclusive of P&P & VAT

All inclusive price list: This means: disc drive + case + all power & data cables + UK carriage + utilities disc & manual + VAT

Model	210	211A	220	221A	596D SANYO
Formatted Capacity per drive on BBC Micro	200K	200K	400K	400K	400K
Single Drive & Case	£75	£89	£119	£154	£149
Single Drive & Case/PSU:	—	—	£114	£179	£174
Dual Drive & Case:	—	—	£229	£289	£279
Dual Drive & Case/PSU:	—	£219	£244	£319	£309

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INTER-SHEET

The electronic spreadsheet program

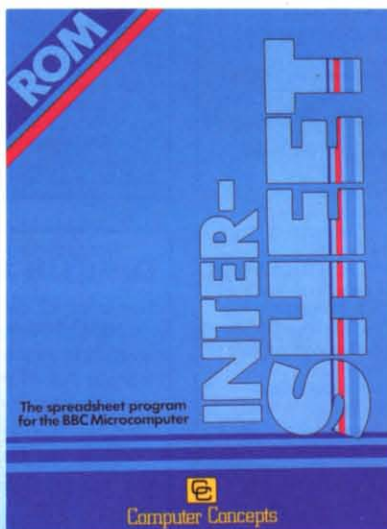
Spreadsheet programs have become powerful and very popular applications for micro-computers, second only to word processors. They can be regarded as a totally general purpose tool.

INTER-SHEET supports a full range of high precision mathematical functions, and a variety of special sheet functions, such as SUM, MAX, MIN, LOOKUP, AVERAGE etc.

Numbers may be printed in three different formats, and with up to nine decimal places. Labels may be left, centre or right justified. All the box formats are alterable on a box by box basis.

INTER-SHEET is supplied on two ROMs. If there is only one socket spare, then it is still possible to access most of the features of INTER-SHEET. The facilities lost are mostly to do with the ROM-LINK integration and multiple spreadsheets.

The INTER-SHEET ROMs are not designed to work with the 2nd processor. However a HI-INTER-SHEET is available on disc that allows 42K of storage on the 2nd 6502 processor. This program requires that one INTER-SHEET ROM is present in the BBC micro, and is supplied at £4.95.



From the same stable as WORDWISE, INTER-SHEET is the first of a new generation of programs, and provides the most powerful and flexible spreadsheet on the market for this machine. This package has many quite unique features—

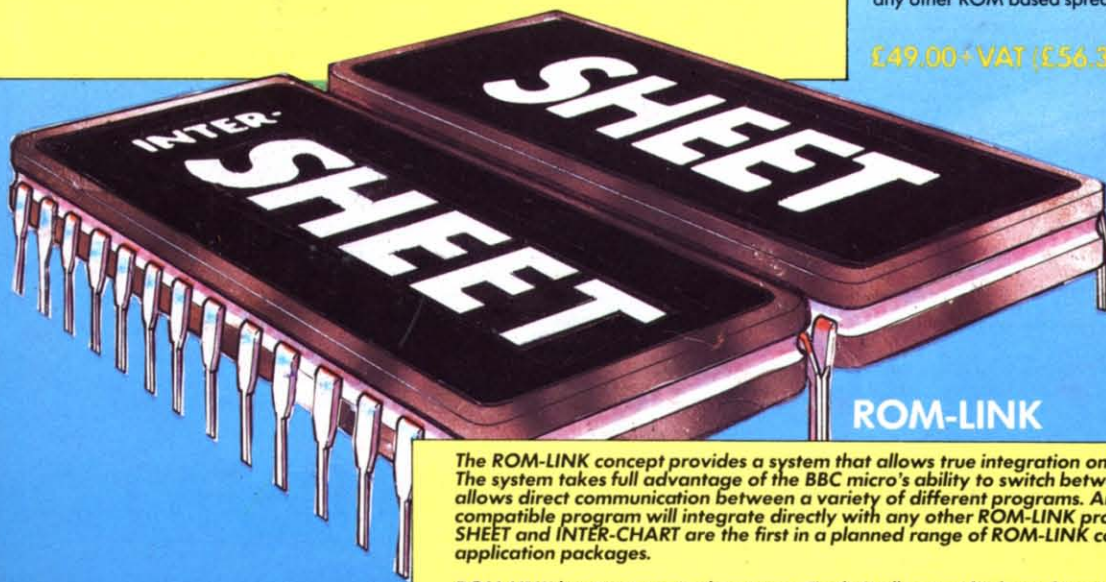
- 1** Up to 16 spreadsheets in memory at the same time.
- 2** Data from one spreadsheet can be used directly by others.
- 3** Compact, tokenised data storage means that larger than normal spreadsheets can be supported.
- 4** 40, 80 or 105 column screen modes. The special 105 column mode allows a far greater proportion of the spreadsheet to be seen on screen.
- 5** Fast re-calculation and replication times (see table).
- 6** Complete documentation—an introduction manual, reference manual and quick reference card.
- 7** Data can be transferred to and from popular word-processors like WORDWISE and VIEW.
- 8** Extensive built-in help menus.
- 9** Will integrate directly with INTER-CHART and other ROM-LINK compatible products.
- 10** Simple to use self prompting commands.

The above points are unique to INTER-SHEET. The last unique feature is the price, lower than any other ROM based spreadsheet.

£49.00 + VAT (£56.35)

Spreadsheet comparisons

Times in seconds	VIEW-SHEET	ULTRA-CALC 2	INTER-SHEET
Replicate SIN(PI) into boxes A1 to Z50	66	65	7
Recalculate the above	28	33	5
Number of bytes free with above sheet	4664	1415	8400
Price (Exclusive of VAT)	£52.00	£69.13	£49.00



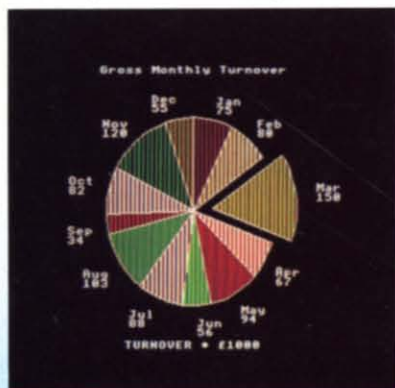
The ROM-LINK concept provides a system that allows true integration on the BBC machine. The system takes full advantage of the BBC micro's ability to switch between ROMs and allows direct communication between a variety of different programs. Any ROM-LINK compatible program will integrate directly with any other ROM-LINK program. INTER-SHEET and INTER-CHART are the first in a planned range of ROM-LINK compatible application packages.

ROM-LINK has two great advantages. Firstly it allows multiple packages (up to 16) to occupy the machine at the same time, so when switching from one task to another there is

INTER-CHART

The chart and graph plotting program

The perfect partner for INTER-SHEET, allowing data to be displayed in a variety of graph formats. Strings of numbers are usually difficult to digest, and it is almost impossible to find any trends in data when displayed numerically. However when displayed graphically even the most complex data can be easily studied.



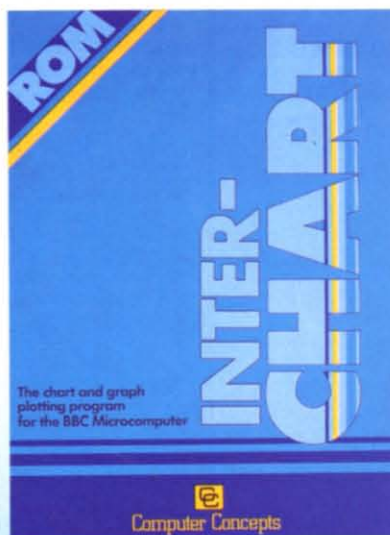
INTER-CHART can accept data from three quite distinct sources. Firstly, directly from other ROM-LINK packages such as INTER-SHEET. Data can be obtained directly from any box, row, column or area of the spreadsheet.

Secondly, data can be entered at the keyboard. At the simplest level the user can type in a series of numbers, and a graph will be plotted from that data.

Thirdly, data can be read from ASCII files on disc or tape. This enables data to be used from other languages or programs or from practically any source that can store the data onto file in the first place.

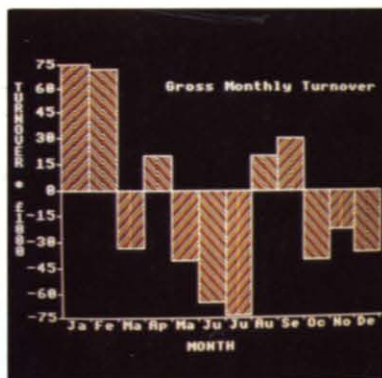
£32.00+VAT (£36.80)

Available from all good software dealers or directly from ourselves at the address below.



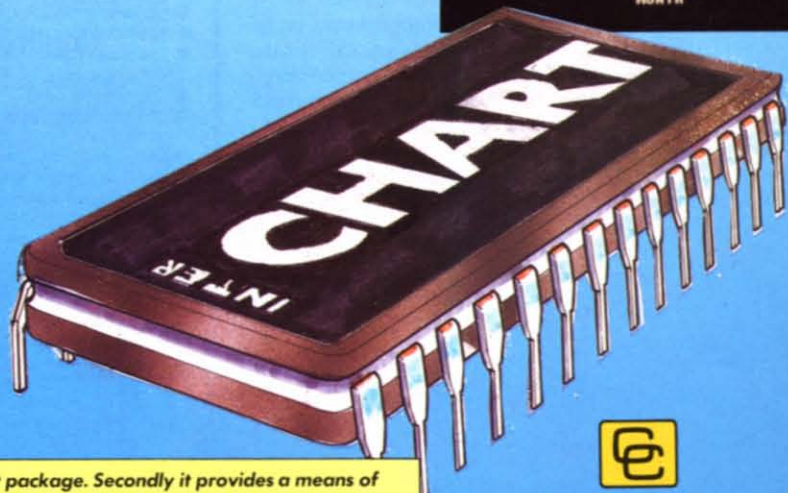
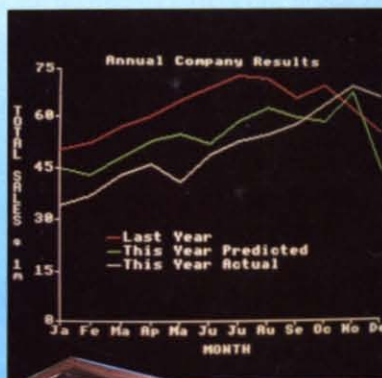
INTER-CHART supports three main types of graph. The pie chart, the line graph and the bar chart. In the pie and bar chart any particular element of data can be highlighted.

Up to 16 separate sets of data (graphs) can be held in INTER-CHART, but because this product is ROM-LINK compatible up to 16 separate INTER-CHARTs can be on the go at once. Many graphs can be overlayed on top of each other (not pie charts) so comparisons can be made between separate sets of data.



INTER-CHART has screen dump facilities for EPSON compatible printers although other printers can be catered for.

Supplied with a full manual and fitting instructions.



no need to save the data before entering the next package. Secondly it provides a means of directly transferring data from program to program.

The system works even if only one ROM-LINK package is present in the machine, for example INTER-SHEET. In this case up to 16 separate spreadsheets may be held in memory and any spreadsheet can use the data from any other.

The ROM-LINK concept will provide a degree of integration not found on any other system.



Computer Concepts

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GEMINI DON'T HANG AROUND

Whilst we're proud to stand and admire our tried and tested range of serious software for the BBC micro — we don't hang around. Our development team are all too aware of the need to keep up with the demands of tomorrow's user and so we are pleased to introduce to you the **'TRIPLE-D'** system.

At last, TOTAL INTEGRATION and data file compatibility between the three most important utility packages for your BBC micro disk system — Database, Spreadsheet and Graphics. Take a look at the specification.

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Of great significance to businessmen, educationalists and hobbyists alike, these programs are certainly the most powerful and sophisticated of their breed, and may be used 'stand-alone' or together as a suite. Gemini have probably the most experience in writing serious software for the BBC micro, with classics such as BEEBCALC and BEEBPLOT achieving sales of tens of thousands of units. We have drawn on almost four years of experience and user feedback to produce what we are confident will be hailed as the ultimate in functional software for the BBC micro: the **'TRIPLE-D'** Integrated Suite. We've also brought it in at a price that should make it accessible to more of you, and most importantly, we're giving you REAL value for money.

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- Up to 2000 records, 1 search level subset, 26 fields/record, 2 drives, 79 chars/field
- Scrolling screen, 79 x 26. Interrupt driven real-time clock
- Layout painted on-screen to your design, including background text/graphics
- Fully menu driven, with powerful line editor and access to 'OS commands
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- Lightning search using advanced 'hashing' techniques
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- Multiple level 'intelligent' sort — program only sorts 'out-of-order' data
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- Solidisk/Econet/6502 second processor compatible
- FULL DATA COMPATIBILITY WITH 'DDD-CALC' AND 'DDD-PLOT'

DDD-CALC £29.95

- True disk-based spreadsheet, 2000 rows, 26 columns, 52000 cells. Powerful line editor
- Fast, smooth machine code screen scroll with pop-down menu
- Individually adjustable column widths with text overflow
- Full relative and absolute replication
- Find and move to a row by name
- User defined variables, delete/insert rows, SORT rows with 'DDD-Base'
- Send data from all or part of sheet to printer, or just print cell formulae
- Data over 1 or 2 drive surfaces
- Fast recalculation, even over large files
- All BASIC functions allowed, plus 'SUM', 'MAX', and 'MIN'. 'OS calls, and real time clock
- Data spool option for merging with other files
- Solidisk/Econet/6502 second processor compatible
- FULL DATA COMPATIBILITY WITH 'DDD-BASE' AND 'DDD-PLOT'

DDD-PLOT £29.95

- Stunning menu driven colour graphics using the BBC's capability to the full
- Pie charts, histograms, scatter graphs, line graphs and function plotting
- Disk save of screen for instant recall within your own programs
- Superb data entry editor with up to 255 plottable data entries for text and x/y coordinates
- Automatic scaling with user override
- Screen customisation allowable after plotting for background text etc., with up to 64 columns in Mode 1
- Disk save of ALL data
- Statistics facilities include mean, max, min, standard deviation, line of best fit, correlation coefficient etc.
- Colours re-definable for any plot
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- Solidisk/Econet/6502 second processor compatible
- FULL DATA COMPATIBILITY WITH 'DDD-BASE' AND 'DDD-CALC'



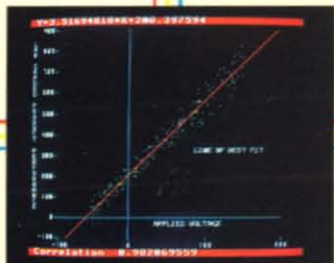
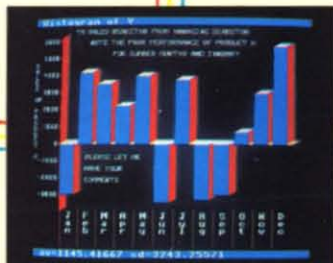
PLE-D' BBC DISK INTEGRATED SOFTWARE SYSTEM

The modules, which are formatted for both 40 and 80 track systems, are available separately, or as an economical combination pack. Each module is clearly documented with a comprehensive, indexed manual, with training sections that refer to demonstration applications provided with each disk. Remember, 'TRIPLE-D' uses proper random-access files that will take advantage of your true

disk capacity, even over TWO drive surfaces. Have you ever heard of a true disk-based spreadsheet before? Well it's here now in the form of the 'TRIPLE-D' suite and can handle up to 52,000 FILLED cells! If you already have our 'DataGem' ROM database, you'll be pleased to know we've even included some special utilities for you! I confidently recommend the 'TRIPLE-D'

suite to you. If you purchase the product from us and don't share my enthusiasm, return it to us in new condition within seven days of purchase and we'll refund your money - immediately and without quibble.

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Gemini Marketing Limited



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0395 265165 immediate guaranteed despatch

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M0109	DDD-Plot		29.95		pac
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FOR THE BBC AND SECOND PROCESSOR

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ALTRA ENIGMA DISC IMAGER

Enigma Disc Imager is a 16K ROM which will give you 29 additional powerful disc commands. Some of which are: Enigma will IMAGE ANY DISC, Copy sectors, Repair bad tracks, Read deleted or special sectors, Dumps roms to disc, Loads roms from disc to sideways ram, Moves a programme up or down in memory, Unlocks locked tapes, Locks your tapes, Dumps cassette to disc, Global or selective renaming of directories, Writes deleted or special sectors to disc, Track and sector ID editor facilities, Selective file copier, Formats discs to be 40/80 track compatible (requires an 80 track drive with this command), Special disc editor to cope with protected discs, Special formatter to format discs with non standard tracks, Inserts new files into the catalogue, Enigma makes easy work of editing, copying, repairing, etc., of both standard and non standard discs.

ALTRA ENIGMA DISC IMAGER IS TUBE COMPATIBLE

ALTRA PROBE

Altra Probe is a 16K ROM which will give you 59 additional powerful machine commands. Some of which are: Altra Probe will list a basic programme straight from file, Formats basic assembler text output, Disassembles, Unpacks, Super Packs, Relocates, Edits memory, Switches off roms, Lists roms, Copies roms to specified address. Calculates free memory, Copies screen text to printer, Lists all specific types of basic variables and values, Graphics dump for Epson or NEC printers, Calculates and details free space on a disc, On board formatter which will automatically format a dual disc, Onboard formatter and verifier. Repairs bad tracks, Disc sector editor, Turns the tube on and off. These are only a few of the commands available from Altra Probe. Altra Probe makes easy work of editing, programme development, etc.

Altra Probe is available in two versions. PROBE1 and PROBE 2.

ALTRA PROBE 2 IS TUBE COMPATIBLE

ALTRA BASIC ED

Basic Ed, is on 8K ROM which contains 21 additional commands. They are: \$ search, List matches, Number matches, Global replace, Selective replace, Bad programme relink, Copy lines from one part of a programme to another Format a listing, Move, Super pack, Renumber, Table line references, Unpack, Variables X ref, List entire programme, Keyboard immediate mode, Printer on/off, Paged mode on/off, List match lines, Concatenate, Strips rem, spaces etc. Altra Basic Ed, is an essential helpful tool for the Basic/Assembler programmer. Altra Basic Ed. is available in two versions. Basic Ed.1 and Basic Ed. 2.

ALTRA BASIC ED. 2 IS TUBE COMPATIBLE

ALTRA FIRST AID 1.1

First Aid 1.1 is an 8K ROM which contains 19 additional commands. They are: Machine code disassembler, Hex and ASCII dump, Sideways rom to ram copier, Function key predefined facilities, Variable table listing, Memory space free calculator, Checksum calculator, Rom lister, String search, Define function keys with strings, Rem and space Stripper, Bad programme fixer, Clear all variables, Clear ram from &0400 to &8000, Machine code monitor. Lists O.S. calls with their vectors, Lists the first 24 control codes. Altra First Aid 1.1 was designed to assist the Basic/Assembler programmer and the sideways rom user.

ALTRA TUBE EDITOR

ALTRA TUBE EDITOR is a new and unrivalled full labelling Disassembler and editor Rom for the BBC and the second processor. Some utilities of ALTRA TUBE EDITOR are append labels to those in memory, Disassemble in 6502 and 65C02 mnemonics, End file overlay, Delete given label, Delete hex range, Delete markers, Dump memory, Edit memory, Overlay files, Find strings and bytes, Define a hex region, Define a label, List memory, Load labels, List labels, Set memory. Calculate and print values, Print embedded text in a program after a call, Saves Roms, Saves labels. ALTRA TUBE EDITOR also supports many of the 6502 "ILLEGAL" OPCODES.

ALTRA TUBE EDITOR FUNCTIONS IN THE BBC AS WELL AS IN 6502 SECOND PROCESSOR.



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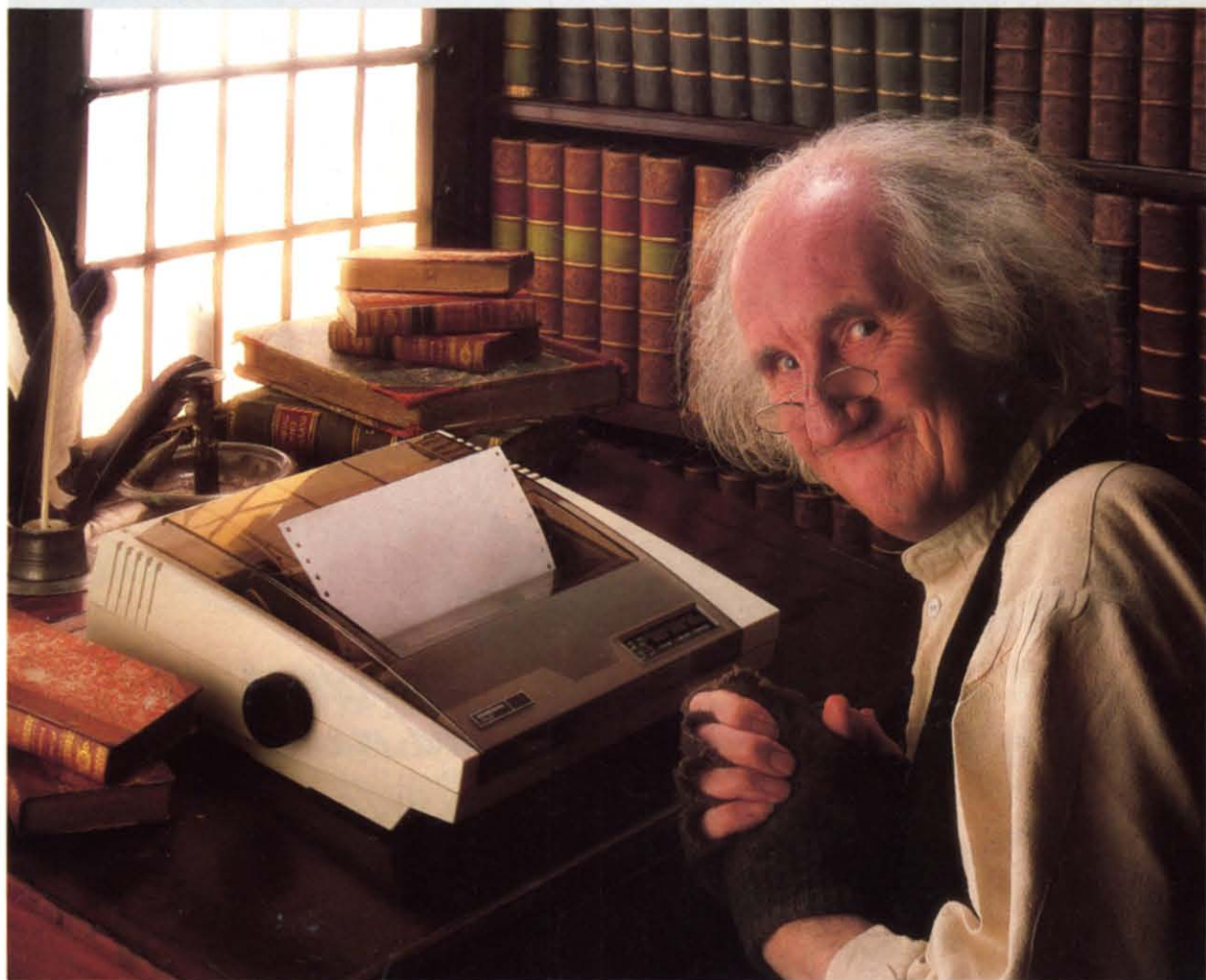
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DEALER ENQUIRIES WELCOME

Thrifty micro owners choose the new MT80+



Keen on saving money? But not prepared to sacrifice quality and performance? Then the new MT80+ serial matrix printer has plenty to offer at a price that will have you rubbing your hands with glee.

The MT80+ prints at 100 cps and is compatible with just about any popular office or home micro. For true print

flexibility, there's compressed and expanded print, subscripts and superscripts, bold print, italics and, of course, graphics.

You'll have to see the print quality to believe it, thanks to the outstanding film ribbon cassette. Continuous fanfold stationery or friction fed single sheets pose no problem. And if you're in a hurry

the quick tear facility is a real bonus.

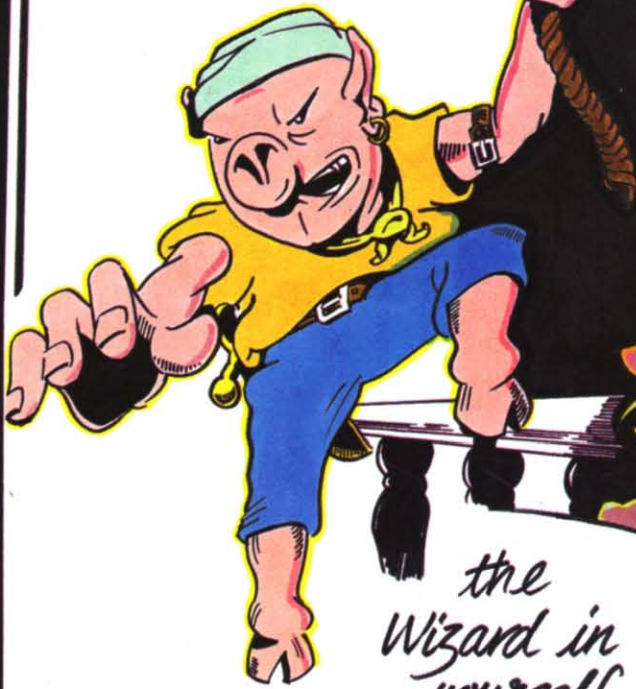
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"the Host in the machine?"



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OS creator at big show

ONE of the leading figures behind the development of Acorn's computers during the last five years, Dr Jon Thackray, will be guest celebrity at the Walk-In Forum during the Electron and

BBC Micro User Show in Manchester this month.

The show, to be held at UMIST from September 27 to 29 inclusive, is expected to break all previous attendance records, repeating the success of its London counterpart in May.

The Forum is a unique opportunity for BBC Micro owners to question leading figures in the industry, including top boffins like Dr Thackray, whose work with computers began during the seven years he spent at Cambridge University earning his triple first in maths and a PhD.

As a research assistant he wrote the adventure game Acheton for the BBC Micro, and designed the compiler and interpreter system necessary to run it.

He joined Acorn in 1982, working on UASM, the predecessor of the MASM assembler used for developing the BBC Micro, and on the Electron operating system. His latest project was the operating system for the new BBC B+.

Apart from Dr Thackray, the distinguished Forum line-up includes Paul Beverley, Norwich Computer Services, taking an in-depth look at Wordwise; Peter Brameld, Database Publications, examining electronic mail and its potential for domestic use; Rob Mcmillan, Acornsoft, discussing the View family of products; Peter Davidson, Database Software, revealing how to create a bestselling software package; Andy Hood, Pace Micro Technology and author of Commstar, unravelling the mysteries of communications.

Such was the success of the London show earlier this year among both exhibitors and public that the Manchester event was guaranteed to be a virtual sell-out several months ago.

Advance ticket sales for UMIST are reported to have never been heavier, and the scene is now set for a microcomputing spectacular.

— See Page 81

ACORN PLEDGES ALL-OUT SUPPORT

AFTER pulling back from the brink of financial disaster for the second time this year, Acorn has pledged users: "We will give you our all-out support".

The assurance was given by the board of directors after yet another rescue package had been worked out with the company's major creditors.

Company has new MD

ACORN has a new group managing director, 41-year-old Brian Long. He joins the company from the Canada Development Investment Corporation.

There his responsibilities included a period as acting chief executive of de Havilland Aircraft Canada.

The new chief executive was previously with Massey Ferguson where he held finance and general management posts in Canada and Europe, rising to become president of a division with a multi million pound turnover.

Brian Long takes over executive responsibilities for Acorn from Alex Uboldi, who will continue as a director of the company.

Although still to be rubberstamped by the shareholders, the refinancing package will give Olivetti 80 per cent of Acorn's shares.

To achieve this the Italian-based multinational has agreed to subscribe for £4 million of new ordinary shares at 1p each by way of direct placement.

Additionally Olivetti will support Acorn's overdraft with Barclays Bank, which will be doubled to £16 million. But this time it will not be linked to stock or debtor levels.

The six major creditors have agreed to accept 50 per cent in cash of the amounts due to them for delivered goods and future delivery commitments.

On completion of the refinancing the amount paid in respect of goods already received will amount to £8.4 million.

This means that the major creditors have now agreed in principle to write off Acorn debts

totalling £7.9 million.

However they will also receive £4.4 million of unsecured loan stock of which, according to Acorn's financial advisers Close Brothers, some £3.7 million will bear interest and be redeemable in five to seven years time.

Meanwhile the BBC has decided to accept a 50 per cent write-off of past royalties due or paid since July 1984, a sum amounting to £2 million.

Balance

The balance of money still to be paid — some £300,000 — will be handed over on completion of the deal.

An official company statement has revealed the reasons for Acorn's plight following on so shortly after the previous refinancing.

It seems that although the company's turnover was on budget during the first quarter of 1985, market conditions since then showed a significant deterioration.

As a result the Acorn board decided it was urgent to make further substantial provisions against stock and debtors at the year ended June 30.

"Since the previous refinancing in February, Acorn has taken swift and

positive action to reduce overheads in line with sales", said the statement. This was in part referring to Acorn cutting its staff from 450 to 271.

"The board believes that the proposed refinancing will provide the company with a stable financial base", the statement went on.

"With the uncertainties about the future removed, the company is now well placed to rebuild its market position and to assure its customers of future product development and support".

PRIZE IS A JOB

YOUNG unemployed computer enthusiasts in the North West are being given a chance of a lifetime by *The Micro User* and its sister publication *Electron User*.

The two magazines have launched a competition with the star prize of a secure job in computing.

Database Publications will provide full-time employment for the winner, who must be an out-of-work school-leaver aged between 16 and 20.

NOW OUT OF ACORNS NEW OAK PCs GROW

A YORKSHIRE based company has launched its own personal computer with more than a little help from Acorn.

Oak Universal of Bradford has restyled and revamped both the BBC Micro and the BBC B+ and transformed them into the Oak Personal Computer.

The Oak PC is being offered with a wide range of options, including a built-in modem.

"We are only too pleased to admit that we grew out of Acorn products", says David Atkins of Oak Universal.

"After all, the BBC motherboards we incorporate have more features, functions and sheer computing power than anything else on the market in the price range".

However the new PC is far from being just a BBC with an Oak badge adorning it.

The protective keyboard casing has been ergonomically streamlined, linking up with a colour-matched slimline processor cabinet.

"It's a lot more than a pretty box though", says David Atkins.

The cabinet - in metal like the keyboard casing - is capable of housing two 5 $\frac{1}{4}$ " disc drives, with each storing between 100k and 500k, depending on the drive fitted.

Additionally the Oak PC 1MHz port permits the connection of a Winchester hard disc.

Prices start at £86.95

for the keyboard and processor casings alone, then work their way up through 14 other available models to the top of the range Oak PC system at £1,325.

Those customers who opt for the ultimate in the Oak PC will find their casings house a BBC B+ motherboard, BBC keyboard, 65 watt power supply, dual 400k double sided disc drive, Z80 second processor, CP/M

operating system, word processor, spreadsheet, graphics, database, accountant, system generator, CIS Cobol and BBC Basic (Z80).

The firm is also offering some 50 optional extras, including a built-in multi function Oak modem and software at £135.

"We believe we have taken an excellent product and made it that much better", says David Atkins.



Acorn unveils its 32 bit Workstation

ACORN has finally moved up-market with its latest product, a 32-bit machine which carries a price tag of £3,595 for the basic model, ranging up to £7,845 for a 4 mbyte system.

The company claims that the Acorn Cambridge Workstation will herald a new era of desktop computing - in that the machine's design owes more to the super-mini than it does to the micro.

This is due to the fact

that the four most popular high-level languages - Fortran 77, ISO Pascal, C and Cambridge Lisp - come with the Workstation as standard and at no extra charge.

And they are a full main frame implementation, not cut down versions for micros.

In addition, making it unmistakably an Acorn product, BBC Basic is also included.

The Workstation hardware has been tailored to create the exact environ-

ment needed for the languages - a large contiguous memory address base, hardware floating point processing, and a fast error-correcting hard disc unit.

Its compact two-box design combines a high resolution, high contrast, direct etched monitor, processors, 1 mbyte of memory, network interface, 640k double-density floppy disc and/or 20 mbyte Winchester disc, all in one unit with a separate 92-key keyboard. All

interface connectors are on the back panel and memory expansion up to 4 mbytes is internal.

Terminal emulation for VT52, VT100 and Tektronix 4010 is also available in ROM.

The 32-bit processor was designed to be a mainframe in a chip.

Also included is an IEEE standard floating point support processor - NS32081 - providing both single and double precision arithmetic - 32 bit/64 bit.

While the Workstation offers a complete system free from reliance on centralised computing services, communications are available to other Workstations or to super minis and mainframes.

"It is a machine designed to be used by scientists and engineers for tasks which are computationally demanding", says Gwyn Matthews, marketing director Acorn scientific division.

"The machine has the computational performance as measured by benchmarks and real application of a dedicated VAX 11/750.

"It's the perfect vehicle for mainframe software on the desk".



Acorn's 32 bit Workstation.

In the drink

BRITAIN's entire 39-strong submarine fleet is being equipped with BBC Micros with disc drives for non classified work and recreational purposes.

The first installation was completed on HMS Warspite shortly before she sailed from Britain late in July.

A central software library to serve the submarine fleet is being set up at Faslane, Scotland, Royal Naval base.

NOW BBC MICROS CAN TUNE INTO SATELLITES

OWNERS of BBC Micros can tune in to the latest space technology thanks to a new device for interpreting data transmitted by satellite.

It is called Astrid - Automatic Satellite Telemetry Receiver and Information Decoder - and is being produced by M M Microwave, the Yorkshire-based radar and communications sub-systems specialist, for £144.

The system comes with aerial and ready to plug into the BBC's serial port.

It has a sensitive receiver and a built-in decoder to convert tones into TTL signals for screen display.

A major feature is that, having been set up, Astrid will automatically receive data transmitted by a satellite passing over it and record it on a standard cassette tape recorder.

It has been designed to receive data from the University of Surrey's two UOSAT satellites placed in circular orbits for experimental data gathering purposes.

In particular, there is regular reporting of

nearly 100 different parameters of spacecraft conditions, beamed down in the form of telemetry for decoding by software programs.

The UOSAT program is helping many British educational establishments understand the operations and role of satellites.

Software available from Amsat UK, the radio amateurs satellite group, allows graphic display of satellite "tracks"

over maps, error correction of received data, disc storage of data for computer analysis, and data presentation of particular telemetry channels.

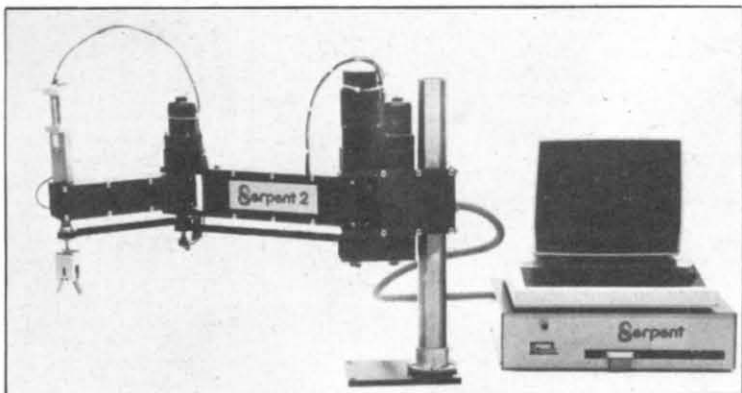
Aerial

The man behind Astrid, enthusiastic radio amateur Steve Webb, told *The Micro User*: "The non-directional VHF aerial is a 38in horizontal rod that ideally should be

set up outside.

"The taping of received transmissions is essential as they involve large amounts of data in a very short time.

"To help users we supply a test tape of sample data and programs and also a handbook which, among other things, contains explanations of the technological and scientific terms that will appear in the ASCII text".



The Serpent Scara robot launched by Cybernetic Applications

Training robot

(£3,363).

"Robots are being used on production lines throughout the world, yet there is very little training at higher education level or industry to bring youngsters up to a standard to enable them to operate, use or design

robots", he said.

"I believe cost is a major factor".

The Serpent II's price tag is £1,525 for the kit version and £1,675 ready built. The Serpent I, different only in its smaller reach, costs £1,500 and £1,560.

Major Logo orders

ACORN distributor 3 SL has given a year's contract worth a minimum of £115,000 to Logo language supplier Logotron.

The company, which supplies the BBC Micro to 190 dealers throughout the North West is selling the machine fitted with the Logotron Logo and sprite boards.

Sales director of 3SL

Bob Feakes said he was convinced the deal would play a major part in promoting increased sales of the BBC Micro, particularly in education.

Feedback

"Already we have sold our first month's supply from Logotron in advance and the positive feedback from several of

the six major education authorities in our area indicates we are only on the tip of the iceberg", he said.

Logo is achieving similar success overseas.

Contracts worth £50,000 each over the next 12 months have been signed between Logotron and distributors in South Africa and Australia.

Interface can run trains

AN interactive interface unit, claimed to bring new levels of sophistication to the computer control of electronic devices, has just been released by Bevan Technology.

Designed specifically for use in conjunction with the BBC Micro, the Companion features eight LEDs indicating input and output, a plug-in circuit board with four input and four output relays and two BNC connectors for composite video signals.

Sophisticated

It can be used to control a whole range of devices from simple home made buggies and train sets to sophisticated scientific and robotic equipment, says Bevan.

With a tape or disc video player the Companion can be used as an interactive video system.

Priced at £347, the Companion comes with a utilities disc.

SECURITY IN A CONSOLE

STOLEN computer equipment accounts for almost three quarters of all school burglaries, says XL Products.

But people can be prevented from secreting computer equipment in bags or briefcases using Microgard, its portable microcomputer security console, claims the firm.

It also says the recently released console, price £60, will help reduce the amount spent on security systems such as alarms, strong rooms and security patrols.

Tape offer

A 20-minute tape of sound and music made entirely with the new version Music 500 synthesiser for the BBC Micro is now being offered at £1.95 by Hybrid Technology of Cambridge.

HI-RES GAMES

FIVE cassette games with high resolution graphics and sound have been released for the BBC Micro by Bevan Technology - April Showers, Aabatron, May Day, One Last Game and Digital Defender.

Aabatron is a 20-screen alien zapping game for keyboard or joystick. May Day is a machine code game featuring a high-score table and is also joystick compatible.

One Last Game has 20 selectable screens with horizontal action and is also joystick compatible.

Digital Defender is an arithmetic practice game for five to twelve year olds.

They cost £7.95 each.

Nuclear energy program

BRINGING schools bang up-to-date on recent advances in energy production is a new computer package for the BBC Micro.

The program, published by Longman Micro Software, is aimed at helping pupils investigate the workings of a nuclear reactor by simulating the operation of an advanced gas-cooled plant.

Component parts such as the reactor core, boiler and turbine can be studied separately or the system as a whole.

Users can set up the program to their own requirements or select a demonstration option.

Physics

The package is aimed at the 14-18 age group but can also be used as an introduction to nuclear physics for older students.

It is accompanied by booklets for the teacher and student which give a detailed description of the model, information on reactors in general and the AGCR in particular, a brief bibliography, suggested methods of using the program and exercises.

The package, which costs £14.50, was developed by the United Kingdom Atomic Energy Authority and the Computers in the Curriculum Project at King's College, Chelsea.

Tubelink is expanding

TUBELINK, the Prestel database for BBC Micro owners, has celebrated its first birthday in sight of its 1,000th user registration and with more than 700 pages accessible.

The Viewfax 258 service, edited by 15-year-old Benjamin Rietti, has become particularly popular with Acorn 6502, Z80 and Torch second

processor users.

Its team of specialist contributors includes Geoff Cox, Z80 and CP/M expert, and John Snelgrove on the 6502. Well known software writers who deal with user problems and contribute hints and tips include David Martin, Andy Hood, Richard Russell and Jeremy San.

Tubelink currently carries arti-

cles on communicating across the Tube, machine code for beginners, ROM compatibility lists and ROM software reviews.

It recently expanded its pages to incorporate Tubelink Plus which houses three sub-sections - RAM-link, Mouselink and Pascalink for Solidisk, Mouse and Pascal users of the BBC Micro.

Aries upgrades expansion board

LATEST expansion board for the BBC Micro from Aries, the B32, features 32k of RAM and a 16k ROM socket.

It provides 20k of shadow screen RAM and 12k of sideways RAM like the BBC B+ but has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

Aries technical director Peter Headland says: "By fitting both Aries B32 and our ROM/RAM board Aries-B12, users can have a BBC Micro with 80k of RAM and a full 16 sideways ROM/RAM slots, which is considerably better than the B+."

Provision of the on-board ROM socket means that the board's control ROM does not

use up one of the existing ROM slots.

Features include 16 new commands, simplified direct access to screen RAM and the ability to move or swap the contents of any area of memory.

Aries says it will make available an upgrade ROM for Aries B20, allowing existing owners to use many of the new Aries B32 commands. Price of the B32 is £80.

Learn on disc

SOFTWARE house Kosmos has released all its leisure and learning cassette programs on disc.

And they are providing an upgrade service for £2 for anyone wishing to exchange their cassette programs for disc versions.



PRIZE MICRO

PUPILS at a Greater Manchester school pulled off a major coup in the Young Electronics Designer Awards 1985 - thanks to a BBC Micro.

Despite not having electronics on the syllabus, the Moorside High team, Swinton, walked away with a commendation and a £300 prize.

Yet the design for an interface unit for the BBC reached the finals from a field of more than 1,000.

The team - Stephen Smith, Scott Stacey, Ian Marsden, David Proctor, Elton Chapman and Leslie Wadson - de-

vised an interface which will allow temperature, light intensity and pressure sensors to be plugged into the computer and readings taken.

Supervising teacher John Chadwick claims it was his team's familiarity with the BBC Micro which proved to be the key to winning a top place in the awards.

Barry Wood's tailpiece

NO, I'm not one to kick someone when they're down, so no Acorn bashing this month. Still, there can't be any harm in just rolling them over with my foot to see if there's any life left, can there?

SINCE I've been on my hols, bulletin boards have been all the rage. I looked at one for the first time yesterday. The communications revol-

ution may be here but people still have nothing to say.

WHAT with software companies folding like demented origami buffs, there's been a refreshing lack of computer whizz kids. Could it be that they've all grown up? Or maybe the media has?

ATOM, BBC Model A,

BBC Model B, Electron, ABC, BBC Model B+. Spot the odd one out?

IT'S no fun any more. You used to be able to ring up Acorn and get a spokesman to deny everything, even that they were spokesmen.

In the process they always used to let you know that they knew, but that you weren't going to know, though the pattern of their

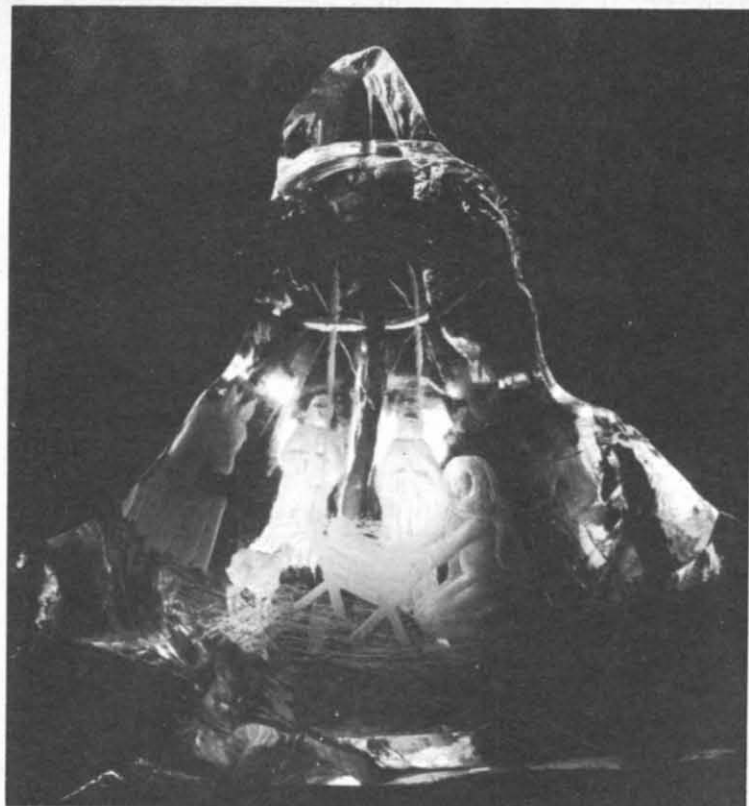
evasions meant that, in fact, you knew what they knew but didn't want you to know and they were always surprised how you knew when they knew they hadn't told you what they knew, as they knew that you weren't supposed to be in the know.

Now they just admit they don't know anything. So what's knew?

SO the disc controller in

the B+ supports double density but is only used for single density. Dense is the right word.

WHAT with all the rumours of redundancies at Acorn, there must, sadly, be more former employees than people still in jobs. I'll bet there are a few stories they could tell. You'll find the address on the contents page, lads.



The Nativity competition trophy

Micros enter Nativity competition

BBC Micro owners have been invited to help fill a gap in our national heritage caused by the likes of Henry VIII and Oliver Cromwell.

Because of these and other iconoclasts there is no British history of Nativity art as there is in other European countries.

But that is something archivists and historians Count and Countess Andrzej von Stauffer intend to correct.

They have organised the First British National Nativity Competition to put Britain alongside the other countries of the world who already have a longstanding tradition of Nativity-making.

It coincides with the Twelfth World Congress of Nativitists, which is

hosted by a different country every three years and this year is at Innsbruck, Austria, in December.

The competition, in two parts, will be held at Westminster Cathedral on December 8 and at the Christian Resources Exhibition at the Horticultural Halls in London on February 8.

Graphists

Count and Countess von Stauffer have been working closely with their international counterparts for eight years, as well as with British craftspeople, artists, photographers and — during the past two years — computer graphists.

They have been helped by Epson UK, which was involved in the Christmas Archives Exhibition, Folk Nativities of the World, at the Barbican Centre last winter.

The Epson connection with the National Nativity Competition is in the special category for the best computer-generated image of the Nativity.

Any part of the Christmas story may be represented, and entries will be judged on originality, content and approach.

Prize

Epson will judge this section of the competition and award a prize to the winning computer artists.

"The winner in the computer category will also compete for the overall Best in Show trophy", Count von Stauffer told *The Micro User*.

"And it is likely to be given a place in the British Nativity archives which will be going on tour to the United States and leading Commonwealth countries shortly".

BBC Micro owners who want to enter the competition should write to National Nativitists Competition, Christmas Archives, 64 Severn Road, Cardiff CF1 9EA enclosing a 24p stamp.

CREAM OF THE CROP...

THE authors of The Free Software Handbook sifted through nearly 1,000 American public domain CP/M programs and came up with 70 "nuggets" for Z80 users.

Their selection, on disc, is now being distributed in this country by Davis Rubin Associates.

The handbook itself overcomes the major problem with public domain software — having to figure out the proper way to use it. The authors explain how each program works.

The 70 programs range from fun and games, through file management and business applications, to complicated "hacker-oriented" programs with something for both the complete beginner and the most experienced programmer.

Available by mail order only, the book costs £17.95. Cost of copying the 1,200k of programs on to the buyer's own pre-formatted discs is £10. Most CP/M formats can be supported.



LOGIC ANALYSER CHECKS 24 CHANNELS

FIRST product to be developed by recently formed Impart Technology is a logic analyser for the BBC Micro.

The A1024 can monitor 24 data channels, four qualifier channels and has a 1024 sample acquisition memory. Clocking is via its own internal clock selectable from 20Hz to 10MHz, or from an external source within the range DC to 10MHz.

The menu-driven analyser uses the BBC Micro

keyboard and function keys to select the various modes of operation and displays the data traces on an associated monitor.

Data acquisition can be made either on a single shot basis or else continuously, where the trigger word is re-checked once a complete trace has been taken.

A compare menu

allows successive traces to be compared directly or against previously stored data. The analyser can also compare continuously and break when an error is detected.

If the BBC system includes disc drives up to 30 data traces and 30 menu setups can be stored to disc. Price, including software, is £750.

A GREAT PACKAGE DEAL!

A professional trio which can be integrated to produce an information management system of exceptional power. For serious users of the BBC Computer.

1 SCRIBE

THE PROFESSIONAL WORD PROCESSOR designed for the serious user. All operations fully prompted. No special knowledge of the computer system necessary. Document size NOT limited by computer memory. Automatic disc buffering ensures text is moved between disc and computer memory without user intervention. Up to 255 pages in a single document. 80 column display on screen underline and right justify. See it as it will be printed. SCRIBE comes in a chip with 5 minute fitting instructions, utilities disc and manual. DISC MACHINES ONLY. £59.95 + 60p p&p



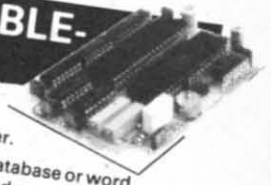
2 DATABASE

A superb information management system with an incredible operating speed. 96 fields per record. One record 2 Kb max. One field 900 characters max. 4000 records per database. 16 level conditional search. Find any record in 2 secs. Wild card search. Record match. 8 automatic sub indexes. Total flexibility of output via report writer with auto write back to any field. Maths pack. Semi programming language. Integrates with Scribe to give conditional search with MAIL MERGE and high powered report formatting. Database is in a chip. DISC MACHINES ONLY. £49.00 + 60p p&p. Scribe & Database in one chip. £95.00 + 60p p&p.



3 DOUBLE-DOS

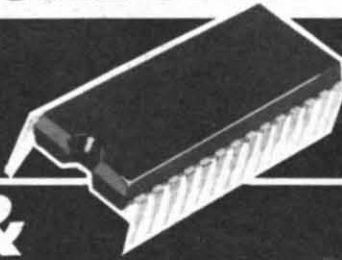
Double density disc interface for the BBC computer.



A high capacity database or word processor is enhanced even further with this state of the art disc interface. The many features include: almost 800 Kb of CONTINUOUS file space on a standard 80 track disc drive. Automatically read standard Acorn files. Compensate for discs formatted in single density. Provide up to 156 files IN ONE DIRECTORY. Automatically read, write and format double sided drives to appear as one disc surface. Allow maximum use of MERTEC Scribe and Database. Fitting to your computer is made exceptionally safe and reliable by providing connection via a flexible ribbon cable. Full instructions provided. £109.25 + 90p p&p

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IMPORTANT NOTE:
Please check with us if you decide to use any other disc interface than Acorn or Double-Dos with Scribe or Database.

28 MICRO USER September 1985

Traders get own package

WHOLESALE and retail traders who need help with their transactions but do not require complex accounting facilities are now catered for by Meadow Computers' Micro-Trader program for the BBC Micro.

It has all the normal accounting requirements and fully integrates sales, purchase and nominal ledgers.

The nominal ledger holds 400 accounts and covers income, expenses, assets and liabilities, and updates trading reports using the other ledgers.

Its VAT program has been approved by Customs and Excise.

Transaction posting and entry of new accounts is taken care of by the other two ledgers, which hold up to 450 accounts.

The sales ledger provides printouts of all customer invoices and statements and quick access to any accounts.

Finally, the purchase ledger deals with invoices and presents a monthly statement. Payments are automatically deducted from the bank account.

Any Epson-compatible printer can be used with the program which is disc based and costs £200.



ADVENTURE ON DISCS

ENTHAR Seven, from Robico Software, is an adventure on two discs for the BBC Micro, with 450 locations and long atmospheric descriptions.

Most of the messages are stored on a database disc, and they have been compacted, using the same techniques as in Robico's tape-based adventures, to about half their original length.

When expanded, there is about 150k of text.

Software house raps soccer stars

A NUMBER of leading British "soccer heroes" are attempting to hold UK software houses to ransom, according to a publisher of BBC titles.

Footballing celebrities are said to be making "extortionate demands" for up to 75 per cent of all profits to allow their names to be used to promote games.

The claims come from Malcolm Howard of Qualsoft, whose mail

order company has just released Mexico World Cup '86 for the BBC Micro.

Nor is it simply a question of the stars requesting huge payments after they have been approached by software houses.

Touting

It seems that famous players are actively touting for the business themselves.

Malcolm Howard revealed to *The Micro User* that three well-known footballers approached Qualsoft with propositions while the new game was being written.

"They were quite willing to sell their names to the game", he said. "I find this worse than prostitution".

Qualsoft turned them down flat.

"We spent 12 months producing the soccer management game and there was no way we were

going to debase it in that way", said Mr Howard.

"These people aren't interested in computing. In fact I'm sure they wouldn't know which keys to press".

However the Qualsoft executive feels there are other less-scrupulous software houses who would be eager to take on the stars for the promotional value of their names.

"It is this lack of real involvement that leaves many football simulation programs resembling little more than arcade games", says Mr Howard.

And football players are not the only celebrities eager to jump on to the software names game bandwagon.

Mr Howard alleges that athletes, cricketers and pop stars are looking at it as an easy way of making money.

Meanwhile Mexico World Cup '86 is due to

be launched this month in time for the qualifying rounds of the World Cup proper.

"We will be relying on the skills of our programmers to ensure that it is a winner - not the name of some money-hungry player", says Malcolm Howard.

Pretty plotter

THE Plotmate computer plotter for the BBC Micro by Linear Graphics was originally seen as an aid for generating line drawings, maps, graphs and charts.

But, says LG, it is now being used for drawing coloured overhead transparencies directly onto acetate, presenting financial information and computer aided design of PCB layouts.

Just the ticket for those labels

AN Intacs 5200 series of plug-compatible intelligent imprinters has been released by Dennison for the BBC Micro.

It claims its models allow the in-house production of labels, nameplates, tags and tickets cheaper than a dedicated label-printing system.

The Series' 5202 operates at 120cps in 80-column width and the 5205 at 350cps in 132-column width.

Different systems can be provided to suit various applications and their prices vary accordingly, says Dennison - the 5202 costing from £1,285

and the latter £2,934.

Both printers incorporate a Dennison designed and manufactured printed-circuit board providing a high-speed interface and internal RAM, ROM and processing capabilities.

The machines can print on to a range of stock including polyester label materials and can produce expanded characters up to 10in high. They can also print numbered bar codes sequentially.

A Basic software disc is supplied with each printer and can be duplicated or modified by the user if required.

Schools software database

DISTRIBUTOR Vector Marketing has come up with a system to make selection of educational software for the BBC Micro as painless as possible for Britain's schools, colleges, universities and education

authorities.

Education establishments can now telephone 0933 79300 or write to Vector stating the subject, age group, and data system the software is required for.

Vector will then

process this information through its database of more than 7,500 educational titles and supply a free printout showing the programs available together with a brief description of the content, order code and price.

NEWSLETTER

£1½m computer to the rescue

THE phenomenal growth of MicroLink has hastened the purchase of additional computer power by Telecom Gold.

Demand for the new electronic mail service has been such that despite the tremendous processing power of a Prime computer, at certain times of the day users have been inconvenienced by motorway-like congestion caused by the large volume of traffic.

Since it started, MicroLink has had to share its computer with the somewhat verbose members of the European Parliament. The traffic jam

worsened as subscribers from all over Britain and Europe and as far away as Australia and Japan began logging on in increasing numbers.

With MicroLink growing at more than four times the predicted rate, the result left it no option but to request a separate computer for its exclusive use.

Telecom Gold has come to the rescue and on September 7 MicroLink will be moving to its own £500,000 dedicated system – much to the relief of its own users and the Euro MPs.

The move will enable

MicroLink to provide an increasing number of exciting facilities, together with a response time described by its systems manager, Colin Rogerson, as "super quick".

Telecom Gold officials have been staggered by what they describe as "the phenomenon of a specialist service growing so big in such a short time".

Rogerson believes he knows exactly why MicroLink has taken off so dramatically.

"It's more friendly than other electronic mail services, it's informative, and it's fun to use", he says.

It's all systems go...

THE ever-ready Help Line came to the assistance of a distinguished early MicroLink subscriber, Conservative MP for Acton Sir George Young.

He mailed to say: "The screen does not scroll when it is in the Telecom Gold mode. The new lines simply superimpose on the old, making it very difficult to read messages."

"I have a BBC Micro with a Telemod 2 modem and a Micronet 800 ROM. To access Telecom Gold I have to generate a new Return signal. What am I doing wrong?"

What Sir George was doing wrong was trying to access the service using Micronet 800 software.

Help Line was able to give him two options – either get a Commstar ROM, which has both Prestel and terminal emulation, or keep the Micronet 800 ROM and use it with a terminal emulation program such as Termi.

Shortly afterwards Sir George was able to report "all systems go" at his end of the system.

Popular abroad

NOT only is MicroLink the great new national electronic mail service – it's also making a name for itself on the international scene.

On the Continent there are already subscribers in Belgium, France, Luxembourg, Spain, Switzerland and West Germany.

Further afield are its members in Saudi Arabia, Australia, New Zealand and Japan.

There are even a couple of subscribers stationed at British Forces bases in

Germany, in addition to those in the UK and the Republic of Ireland whose numbers increase daily.

Why is MicroLink so popular abroad?

Says one happy customer: "It's a very good way of sending information by the international PSS system, it's faster and more economical than telex, and it's portable."

"I can take my lap-held computer just about anywhere and still be in touch with MicroLink – at any time of the day or night".

Showing 'em how

MICROLINK will be notching up another first when it goes on-line from the Electron & BBC Micro User Show in Manchester.

A continuous demonstration of the new service will be held at UMIST from September 27 to 29, with experts on hand to reveal the full potential for users.

Stories about the show will be transmitted live over MicroLink's own electronic news pages during the three-day event.

MicroLink forges commercial ties

NEW commercial ties between Britain and Japan are being forged by MicroLink's speed and efficiency.

For several years Bristol electronics engineer Jeff Gearing has been UK correspondent of a Japanese motor magazine, regularly sending his news reports by mail on floppy discs to its editor, Yuichi Ishikawa.

Other than expensive long-distance phone calls, the two men had to rely on the five-day-minimum airmail service to keep in touch.

Until MicroLink, that is.

Now both Gearing and Ishikawa are subscribers of the fast-growing international mail service, and news about Britain's motor industry gets to Japan in

seconds rather than days.

MicroLink has paid off for them in another way – high-speed two-way exchange of up-to-the-minute business information that can be sold as a service to commercial concerns.

And this has led to a further profitable spin-off.

For some time Gearing and Ishikawa had been

aware that there was a demand in Japan for luxury European goods, and in Britain for Japanese-made models.

MicroLink is now providing the fast, low-cost medium for import/export orders resulting in an increasing flow of Wedgwood pottery from Bristol and radio-controlled models from Tokio.

YOUR chance to join MicroLink – turn to Page 71

The best name in memory is now also the best name on record...

You no doubt know our name for disk drives. We've spent years on research, development and marketing a range of drives second to none. A logical extension for us was to introduce diskettes. Only when we found a 5¼" double density diskette up to our stringent quality control requirements, and at a price that made sense to the end user, were we ready to put our name to it.

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AMX MOUSE

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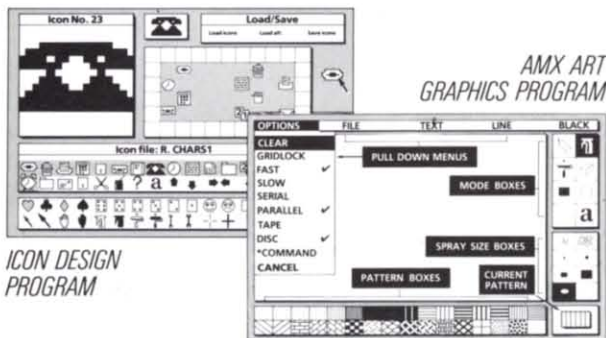
Finalist for Peripheral of the Year...that's how successful the AMX MOUSE is. Supplied as a package with the superb ICON DESIGNER and AMX ART programs, it has proved enormously popular. Not to mention the recently launched AMX UTILITIES and AMX DESK. And now Advanced Memory Systems brings you an exciting new addition to the AMX software range — AMX PAINT POT! PAINT POT lets you fill in with colour any pictures you've made with AMX ART. Now you can bring your drawings to life with rich, vibrant colours. And with a palette of 256 different shades, you certainly won't be short of inspiration! The software even includes eight exciting pictures to start you off.

There's more, too. You can store up to twenty coloured illustrations in 'Picture Show' mode, which will then display your works of art in sequence, automatically or manually at the touch of a MOUSE

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Got your MOUSE yet? This amazing opto-mechanical device brings facilities once only available on the most expensive computers. Use it with any Model B fitted with the Operating System 1.2. It's compatible with the 6502 second processor, and disc or tape filing systems. Great for Wordwise+ and View.

Also included are two superb graphics programs: AMX ART, which makes full use of windows, icons, menus & pointers; and ICON DESIGNER, for creating and storing icons for use in your own programs. The complete AMX MOUSE package includes Disc, Cassette, Two manuals, EPROM and of course the MOUSE.

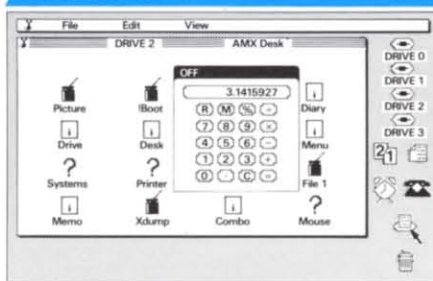


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It's brand new...it's educational...and it's great fun! Don't miss this quality product from AMS; avoid the rush by ordering NOW.

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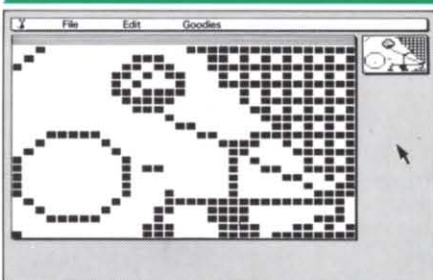


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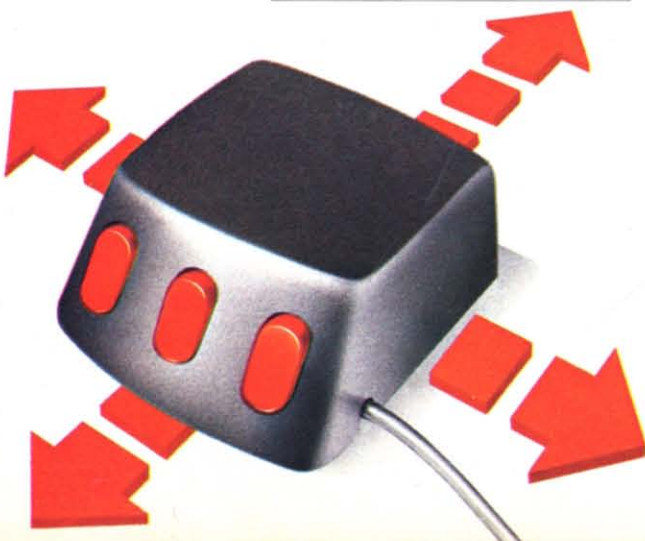
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- ★ TRANSFER—Records from one file to another.
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REPLICA II £12.00 40/80 3"

In addition to working with the standard single density DFS's REPLICA II is now compatible with the following double density DFS: OPUS 3.45, UDM v. 2.00 and CUMANA QFS.

The original REPLICA set a very high standard so the specification that we set our chief programmer presented him with a real challenge. In fact REPLICA II is now 2 separate programs, one for DFS using the 8271 controller and the other for the various DDFS that fully implement OSWORD & 7F. REPLICA II will transfer many of your cassette based programs to disc, even more than REPLICA did. Now when you buy disc drives you do not have to throw away your expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below & E00, those with up to 9 sections and those up to & 6E in length e.g. adventure programs. No more waiting for 6 minutes whilst your adventure programs load.

REPLICA II is very easy to use and the user just enters a name, how many sections and whether CHAIN, *RUN or *LOAD is used to load the first section. Press play and let the program do the rest, even a menu. Just think how much it will cost you to buy a disc version of your favourite program—it is probably more than REPLICA II, which will hold up to 16 programs, limited only by the disc capacity and catalogue.

STATE DFS & 40 or 80 tracks

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- ★ NESTED Procedures can also be grabbed automatically

A Procedure can be a FUNCTION, a BASIC program or part of it or a PROCEDURE.

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This is the first module in an integrated accounting suite of programs written to be used and not simply to please an accountant. This module contains an INVOICE and DELIVERY NOTE program with 80 column input and screen editing, you see what will be printed before committing yourself. Account customer details are inserted automatically and delivery notes generated automatically when required. Customer details without account numbers can be automatically placed in a Beta-Base compatible file for use as a mailing list.

A sales ledger sheet is printed automatically when there is enough data to fill a page, alternatively the user can print the ledger sheet before a full page to suit his needs. VAT details are generated at the end of the VAT period and the year to date figures can be viewed at any time. Provision is made for multiple VAT rates including standard, zero, export and exempt.

A transaction file is generated for account customers for use with the STATEMENTS and ACCOUNTS RECEIVABLE module.

Future modules will be STATEMENT and ACCOUNTS RECEIVABLE, STOCK CONTROL, ACCOUNTS PAYABLE and NOMINAL LEDGER. All relative files are compatible with CLARES Beta-Base which can be used to manipulate the files as required. A Beta-Base Utilities Disc will soon be available and will provide Mail-Merge facilities and links into ULTRACALC plus many other features.

- ★ INTEGRATED ACCOUNTS and DATABASE
- ★ MULTIPLE VAT rates
- ★ SCREEN EDITING with insert & overwrite
- ★ AUTOMATIC DELIVERY NOTES
- ★ INVOICE COMMENTS
- ★ ACCOUNT HOLDERS details inserted automatically
- ★ MAILING LIST generated automatically
- ★ LEDGER SHEET printed automatically
- ★ VAT sales returns prepared
- ★ TRANSACTION FILE generated
- ★ Beta-Base compatible

This program was written for our own use and is used to prepare hundreds of invoices per week. It has no unnecessary questions or keys to press and extensive but easy edit options, we have made life as easy as possible for ourselves so why not take advantage of our efforts.

Requires double sided single or twin single sided drives for minimum configuration -no stock control or customer database. Double sided twin drives will enable a full integrated system to be used.

FUN HOUSE £10.00 40/80 3"

FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated. Each room exercise is terminated with a warning item e.g. the lounge finishes with 'FIRE' which goes on to engulf the whole lounge. Tests with a newly hired 4 year old resulted in us having to prise him away from the keyboard after 2 hours. In that time he had gone from never having used a keyboard to finding the location of all the keys very quickly and entering the correct answer. He had thus started on the path to learning spelling and familiarised himself with the keyboard including the use of DELETE to correct his mistakes. Can you afford not to give your children the same start?

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BROM  £34.50 ^{40,80}_{3"} £27.50

BROM is the first toolkit ROM to provide a FULL SCREEN EDITOR, which means that you can scroll your program up and down just like WORDWISE does with text, do not confuse this powerful editor with the line editor used in other toolkit ROMs. The EDITOR allows insertion and deletion of lines and insert and overwrite within a line. This is the editor that the BBC micro should have had.

Closely related to the EDITOR is the EXTENDED ERROR HANDLING which will trap errors in a program and enter the EDITOR at the line generating the error, not only that but it will also position the cursor as near to the statement causing the error as possible, no more wading through multi statement lines trying to identify the error.

Commands unique to BROM are:

ROMON & ROMOFF which enable you to turn on/off sideways ROMs so that they stay off even after CTRL/BREAK, very useful for avoiding clashes especially for users with second processors. This also works with the DFS and reverts to PAGE & EOO automatically.

CASE which forces input into upper or lower case irrespective of caps/shift lock.

FLIST which lists a program one statement to a line but more importantly it will even list 'BAD PROGRAMS.'

ONEKEY is a single key entry option but you can also define your own strings to any ASCII key, just like an extra 48 function keys.

Another group of commands provide FIND and selective or global SEARCH and REPLACE facilities. These commands work with strings and keywords or a mixture of both e.g. "FIND PROChelp T", will list the full line containing PROChelp, the 'T' simply tokenizes any keywords.

Yet another group of commands allow lines to be moved or copied to a new location.

The other commands provide function key editor, 'BAD PROGRAM' cure, variable lister, integer variable flush, program compacter etc.

This is a genuinely useful ROM that no user should be without. Be warned, once used you will not be able to live without it!

"...this is the best On-Screen BASIC Editor I have ever used; it is far superior to BEEBUG softs Toolkit."

Viewfax Tubelink

The Brom disc is suitable for use with SOLIDISK SIDEWAYS RAM.

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40	40 TRACK
80	80 TRACK
3	3" DISC—ADD £3
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BBC B + DFS + ECONET	£395
BBC B + DFS + 32K RAM Card	£397
BBC B + 13 ROM Board fitted	£322
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Complete BBC B ECONET Networking System
now available.

(P.S. ROM based software purchased with any of
the above Micros will be fitted free of charge).

6502 Acorn 2nd Processor	£175
Z80 Acorn 2nd Processor	£339

TORCH Z80 Card + Perfect Software	£275
TORCH Z80 Card + Soft. + Disc Pack	£550
TORCH GRADUATE Z80 System	£900

Acorn Bitstick	£325
Acorn IEEE Interface Complete	£280
Acorn Teletext + Interface	£195

(Securicor carriage on Micros £7)

Dust Cover for BBC Micro

£3.50

NEW

SEIKOSHA SP-800

This new attractively finished dot matrix printer features Near Letter Quality mode and is unsurpassed at the price. Provides high quality printout for word-processing, whilst retaining a fast mode (80 CPS) for draft copies. Other features include a variety of character sets, underlining, bold print and double strike, bi-directional logic seek, automatic paper loading, variable paper width etc. Friction Feed; Tractor feed optional extra. SP800 makes available the facilities of much more sophisticated printers at a very reasonable price.

Introductory price: £189 (carr £6)

EPSON LX-80 PRINTER

EPSON's new Low cost High performance printer. Print speed 100 cps, NLQ mode 22 cps. 9 needle print head. Full FX-80 capability is supported with downloadable fonts. Friction feed is supplied as standard, with tractor feed and an attractive auto sheet feeder. NLQ Mode and current typeface selectable from front panel. This attractive 'HiTech' design printer also features some powerful word processing functions built in, e.g. can auto justify a line of text sent to it.

Introductory price: £225 (carr £6)

SPECIAL OFFER

HITACHI EPROMs for Sideways ROMs

2764-250ns £2.50

27128-250ns £4.00

RAMs (Low power) for ATPL, WATFORD, etc.,
Sideways ROM Boards

6264LP (8K) £5.80

4 COLOUR PLOTTER PRINTER

SAKATA SCP-800 printer/plotter facilitates plotting & printing in 4 colours on paper upto A4 size, using easily replaced pens. In text mode it prints upto 12 CPS. Max 160 Char. per line. In graphics mode it offers full plotting facilities incl. drawing, moving, scaling of text, rotation & drawing of axes. (Write for a sample printout).

Only £175

Set of 4 SPARE PENS only £3.95

PRINTER SHARERS

Connects	
3 BBC Micros to 1 Printer	£65
6 BBC Micros to 1 Printer	£129

BROTHER HR-15

Brother HR15 is a high-quality daisy-wheel ideal for a budget printer for serious use. Notable features of this printer include a 3k buffer, 18cps (max), bi-directional proportional spacing, Centronics interface standard, (RS232 optional), optional Sheet Feeder and Keyboard.

ONLY £325 (carr. £7)

Single Sheet Feeder	£185
Electronic KEYBOARD	£135
TRACTOR FEED Attachment	£84

RIBBON CARTRIDGES:

Fabric £3.75; Carbon £3.75;

Multistrike £6

DAISYWHEELS (various typefaces)	£18
---------------------------------	-----

With immediate effect, we are offering at
no extra cost ON-SITE 12 months
Maintenance on all HR15 Printers purchased
from us.

W.E. GIVES YOU A GREAT DEAL

Listing Paper (Perforated)

1,000 Sheets 9½" Fanfold Paper	£7
2,000 Sheets 9½" Fanfold Paper	£13
1,000 Sheets 15" Fanfold Paper	£9
Teletypewriter Roll (Econo paper)	£4

Carriage on 1,000 Sheets £1.50

PRINTER LABELS

(On continuous fanfold backing
sheet)

1,000 90x36mm	£5.00
1,000 90x49mm	£7.75
1,000 102x36mm	£6.25

Carriage on 1,000 Labels £1.00

All prices exclude VAT

KAGA KP810 NLQ PRINTER

This excellent printer is fully Epson FX-80 compatible and offers superb NLQ printing. Over the last year, we have sold more of these printers than any other make. Write in for further details of this printer.

Special Offer: ONLY £239 (£7 carr.)

Kaga RS232 Interface	£49
Kaga RS232 Interface + 2K Buffer	£69
Kaga RS232 Interface + 16K Buffer	£95

KAGA KP910 Printer

Similar to the KP810 but with 17" carriage for wide print. Gives 156 columns of normal print or 256 columns in condensed mode. Ideal for printing out spreadsheets.

ONLY £339 (£7 carr.)

PRINTER LEAD

Centronics lead to connect BBC micro to
EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI,
BROTHER, SHINWA etc. printers.

Standard length (4 feet long)	£6
Extra long (6 feet long)	£9

We can supply leads to any required length.

RS232 Cables available in any length and any
combination. Please telephone for your
requirement.

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
RX100/MX100/FX100	£10.00	£5.25
FX80/MX80	£4.50	£4.95
RX80	£4.50	£4.50
GP80	£4.50	-
GP100	£4.95	£3.95
GP250	£5.95	£3.95
KAGA KP810	£5.95	£4.75
CANON PW1080	£5.95	£4.75
MICROVITEC MONITORS	-	£5.50

Our attractive 'Dust Covers' are manufactured
from translucent PVC. The seams are stitched
and edges are taped to prevent splitting due to
continuous use.

PRINTERS

● EPSON RX80 Printer	£209
● EPSON RX80 F/T Printer	£219
● EPSON RX100	£342
● EPSON FX80 Printer	£315
● EPSON FX 100 Printer	£429
● EPSON JX-80 Full Colour Dot Matrix Printer. Prints in 7 Colours. Upto 160 cps	£525
● EPSON Paper Roll Holder	£17
● FX80 tractor attachment	£37
● Centronics Printer Cable to interface all the above Printers to BBC	£6
(Securicor carriage charge on printers £7)	

EPSON HI-80 PLOTTER

The latest addition to the popular range of
EPSON Printers/Plotters. Prints in upto 10
colours. Has many more features. Please write in
for spec sheet.

£345 (£7 carr.)

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232 £25 RS232 + 2K Buffer £55
IEEE 488 £62



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop.

MICROVITEC

- 1431 - Medium resolution as used on the BBC television computer programme £185
- 1451 - High resolution, suitable for word processing in mode 0 £229
- 1441 - High res, exceeds the capabilities of the BBC micro £385
- 1431AP RGB + PAL and AUDIO £199
- 1451AP RGB + PAL and AUDIO £269
- Dust Cover for Microvitecs £5.50

All Microvitec Monitors are 14" and are supplied complete with cables.

KAGA

- KAGA KX1201G Hi-res Green Monitor £90
- KAGA KX1202G Ultra-Hi-Res Green Monitor £105
- KAGA KX1203A Ultra-Hi-Res Amber Monitor £105
- KAGA Vision 2, Hi-Res, RGB Colour Monitor £225
- KAGA Vision 3, Ultra Hi-Res, RGB Monitor £310

NEW

FIDELITY COLOUR MONITOR

- Medium Resolution, attractively finished, 14" RGB and Composite VIDEO/AUDIO Input. Has a detachable anti-glare screen. Supplied complete with cables.

Introductory Offer: £169

ZENITH

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. The high resolution makes it good for games too - you can really see the detail that has been put into the graphics £66

LEADS

- BNC Lead for Zenith or Philips £3
- RGB lead for KAGA £5
- N.B. Carriage on Monitors £7 (securicor)

NEW

ROM-SPELL



ROMSPELL is the new fast Spelling Checker ROM from Watford. Packed with excellent features, ROMSPELL is probably the most advanced spelling checker available for the BBC micro.

Features include:

- 30,000 word dictionary
- One pass check
- Two pass check
- Ambiguous word check
- Basic access to ROMSPELL
- Immediate entry check

ROMSPELL is fantastic value at £25

(Please specify 40 or 80 tracks when ordering)

BBC MICRO WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in for a demonstration.

EXAMPLE PACKAGE

BBC Model B, Watford Electronics' DFS upgrade, WORDWISE ROM, Twin 400K Epson drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 x 3M disc, 500 sheets fan-fold paper, 4 way mains trailing socket, manuals, all leads and BBC carrying case.

NEW LOW PRICE

Only £999



ACCESS & VISA
HOT LINE
(0923 50234)
24 Hours

THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities - he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

This book is superb value at only
£5.95 (Book - No VAT)



This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see elsewhere in this ad).

Only £23

(For software on disc please add £2)

DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.

On disc at

Only £17

(Please specify 40 or 80 track when ordering)
(Please write in for technical specifications)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer. File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.

The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

Cont.

Operations supported are -, +, *, /, +---999999
9999.9999 and compare facilities =, >, <, >>=,
>=, <, &.

Many keywords are supported by the language: assign, compare, display, and, goto, if, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

DATAGEM

Gemini's 24K ROM based
DATABASE Management System

Special Offer: £85

Continued

COMING SOON

The DELTA CARD

Fourth Generation BBC Hardware Representing new standards in economical computing power, the Delta Card is the latest in fast 6502 'processor' boards for the BBC micro. Speed increases of up to 100% are fully supported by an additional 48k of fast RAM (16k sideways and 32k for screen overlay). The Delta Card transforms your BBC into a far more powerful system with FULL compatibility with ALL standard programs.

NEW LAUNCH

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- A complete communications terminal that transforms your BBC Micro into a very powerful Worldwide data transfer system.
- Auto Dials, Auto Answers, Auto Baud selects and is completely controlled by your Micro. There are no external controls!
- Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.
- Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER. Le MODEM does the rest.
- Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELESOFTWARE to be downloaded.
- A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!
- FULLY controlled by simple "COMMANDS" allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!
- Connects to the 1MHz bus. A "AUDIO ON/OFF" command allows you to actually hear the telephone line through your BBC micro loudspeaker.
- Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A "TEST" facility gives ON SCREEN indication that Le MODEM is working correctly.
- Packaged in such a way that you need nothing else except a BBC Micro to communicate with computers all over the world.

- BT Approval applied for.

Launch Price: Only £89 (carr £3)

NEW LAUNCH

The Watford ROM/RAM CARD A must for all serious users

We, at Watford Electronics, have been producing high quality hardware and software products for the BBC for three years now. Having carefully observed the needs of our customers we set our top hardware engineer the task of producing the ultimate ROM board to meet all your ROM/RAM requirements.

After weeks of top secret development we are now able to bring you more details of this, the ultimate in ROM/RAM boards.

- No overheating problems. ● No User Port corruption. ● Full buffering. ● NO SOLDERING. ● No flying leads. ● Firmly mounted. ● Easy fitting. ● Up to 8 banks of 16k of Dynamic RAM. ● One bank of 16k CMOS Static RAM allowed. ● All RAM has Write protect. ● All RAM has Read protect. ● CMOS RAM can have battery backup. ● Special RAM write register. ● Can run any BBC ROM. ● FREE utilities disc. ● Compatible with DDFS boards. ● Compatible with our 32k RAM Card. ● Compatible with our Sideways ZIF. ● Large printer buffer (up to 128k) ● High speed disc backup via RAM.

Obviously, so much RAM requires some powerful facilities to use. To show you just how powerful the features our board offers are, and to convince you that the competition if any, is just simply not worth buying, we shall provide some more details on the advanced features offered.

Each socket has write protection to allow all ROM based software to be run. Also, to help during software development, each socket is equipped with a special read protect facility (this allows recovery from ROM crashes). Up to 8 ROMs and 8 banks (each of 16k) of RAM may be used, or one of the ROMs may be configured to give 16k of battery backed CMOS Static RAM.

The RAM socket selection (which is independent of the normal ROM socket) is performed by a special register at &FF30. In normal systems, a "write" to this location would have no effect. We believe that there is available an inferior board in which, for some totally unexplained reason, the User Port (as used by the AMX Mouse, Eprom Programmers, etc.) is used for the selection. Obviously this was not a very sensible move on the part of this manufacturer.

The ROM/RAM card from Watford represents second generation ROM board technology and is a must for all serious users of the BBC Micro.

Please write in for technical details and further prices.

INTRODUCTORY PRICES:

- ROM/RAM CARD with 16K Dynamic RAM £38
- ROM/RAM CARD with 32K Dynamic RAM £45
- ROM/RAM CARD with 64K Dynamic RAM £69
- ROM/RAM CARD with a massive 128K RAM £109

OPTIONAL EXTRAS:

- 16K Plug-in STATIC RAM £14
- BATTERY for Battery BACKUP £2

The ULTIMATE DFSs for the BBC MICRO

WATFORD TOPS THE DFS CHART

Watford's Ultimate DFS has scored highest points in ACORN USER's unbiased DFS's Review of July 1985. In concluding, the reviewer writes "It must be said that Watford's DFS certainly offers a comprehensive range of facilities at a very attractive price". (Please write in for comprehensive details.) To celebrate the occasion, we are offering Watford's complete Disc Interface Kit at £65 only.

Just compare the features:

Features	Acorn 1.20	Watford	
		Single Density	Double Density
Max nos. of files per disc side	31	62	62
Max disc capacity	800k	800k	1440k
Tube compatible	Yes	Yes	Yes
Built-in Editor	No	Yes	Yes
Built-in Formatter	No	Yes	Yes
Built-in Verifier	No	Yes	Yes
MRUN a file	No	Yes	Yes
MLOAD a file	No	Yes	Yes
Extended RENAME	No	Yes	Yes
Selective COPY	No	Yes	Yes
Default file name	No	Yes	Yes
Disc space distribution	No	Yes	Yes
40/80 Software Switchable	No	Yes	Yes
Wide catalogue	No	Yes	Yes
Close open files	No	Yes	Yes
Improved OPENOUT	No	Yes	Yes
Copy between densities	N/A	N/A	Yes
OSWORD & 7F	Yes	Yes	Yes
Full entry point compatibility	Yes	Yes	Yes
Retain information over a break	1.20 partial	1.42	1.52
Games compatibility	Yes	Yes	Yes
Econet file server	Yes	Yes	Most
Econet station	Yes	Yes	Yes
Full wildcard facilities	No	Yes	Yes

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for two years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade.

PRICES

- Complete Disc Interface Kit incl. DFS ROM & fitting instructions £65
- Acorn's DFS Kit complete £70
- DFS Manual (Comprehensive) (no VAT) £6.95
- (P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs.)
- Watford's sophisticated DFS ROM only £16
- We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only £12
- Watford's DFS is exclusively available from Watford Electronics. Every ROM carries a special label with our LOGO and serial number.

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. - Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc - Ours allows both of these!

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD & 7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- Complete DDFS Kit incl. fitting instructions £79
- DDFS Manual (no VAT) £6.95
- We will exchange your existing Single Density for our DDFS Unit at £40

Quality Disc Drives from Watford Electronics

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track and which are 80 track. The 40 track ones are manufactured by EPSON, the world famous Japanese company, (non-tinted boxes). The 80 track drives are famous MITSUBISHI drives (tinted boxes).

With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them. Users of Acorn's DFS will find that they need to pay the extra for switchable drives if they wish to use 40 track discs in an 80 track drive.

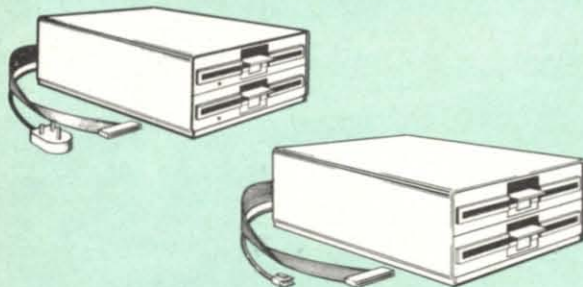
The drives we supply are fast (3ms track to track, 15ms settle), quiet and have a low power consumption (average well under 1 amp). Extensive experience of the usage of disc drives suggests that the MITSUBISHI and EPSON drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro. Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

Names you can trust, at prices you can afford!

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. All single disc drives with power supply, (i.e. CS100, CS200 & CS400S) are supplied in a twin case with twin data cable for later inclusion of a second drive). At Watford we anticipate your needs of tomorrow not just today!

All disc drives advertised here will operate in double density mode with the appropriate interface and software.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
100K (180K)	CLS100 £85		CS100 £107	
200K (360K)	CLS 200 £86	CLD200 £164	CS 200 £110	CD200 £180
400K (720K)	CLS 400 £110 CLS400S	CLD 400 £165	£135 CS 400S	CD400 £185
800K (1.44M)		CLD800 £230 CLD 800S		£259 CD 800S

● TWIN drive CASE, with Power Supply & Cables £35
Securicor carriage on Disc Drives £5

Prefix C = Cased Drive
L = Less PSU
S = Single
D = Double

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES OF DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

3M-5¼" DISKETTES

Top quality 3M-SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

DON'T SETTLE FOR LESS, BUY THE BEST

- 10 x S/S D/D 40 Track Diskettes £13
- 10 x D/S D/D 40 Track Diskettes £18
- 10 x S/S D/D 80 Track Diskettes £22
- 10 x D/S D/D 80 Track Diskettes £24

QUALITY 5¼" DISKETTES at KNOCK DOWN PRICES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs, each with a life-time guarantee. These are supplied packaged in an attractive plastic library disc box to protect them from damage.

- 10 x M4 S-S D/D 40 Track Discs £11
- 10 x M5 D/S D/D 40 Track Discs £15
- 10 x M7 D/S D/D 80 Track Discs £20

DISC ALBUMS

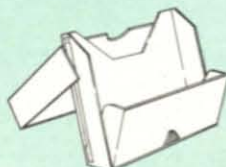
Attractively finished in beige leather-look vinyl, these conveniently store up to 20 Discs. Each Disc can easily be seen through the clear view pockets.

£4.25

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- M35 - holds upto 40 discs £10
- M85 - holds upto 95 discs £12



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE
holds 10 Discs.

£1.80

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

£8

DUST COVERS (For our Disc Drives)

- Single (without PSU) £3.20
- Single (with PSU) £3.25
- Twin (without PSU) £3.85
- Twin (with PSU) £3.90

Continued



EPSON NLQ ROM for the BBC Micro



Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ1 (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:

- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used separately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £22

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.

A must for all VIEW and NLQ ROM users.

£7.00

NEW
LAUNCH

THE NLQ DESIGNER

The Kaga Taxan KP810 and KP910 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on.

A 40/80 track format disc containing 3 example fonts is included in the package.

(P.S. This ROM is not suitable for Epson printers as they don't normally have NLQ ability. Keep reading our adverts though - work is in development!)

NLQ DESIGNER & FONT DISC £25

INDIVIDUAL Preprogrammed FONT ROMS
£15

(Please write in for further details on both the NLQ DESIGNER and the individual font ROMs available.)

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate - if anyone can supply flashing ink we would like to know!

The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.

Two commands are used to operate the dump routines:

*GIMAGE - This provides a full graphics dump of any graphics mode, plus modes 7 and 8. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985

"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro"

"an extremely sophisticated and powerful dump utility".

"VERDICT - Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.

"Well, here is that winner!"

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £24 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers:
CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPV11, NEC PC8023, DMP100/120/200/400, etc. etc.
Price including comprehensive manual

£24

SPARK DUMP ROM

A screen Dump ROM for the Acorn/Olivetti Spark jet printers. Works in modes 0/1/2/4/5/7. Does vertical & Horizontal scaling. Positive & Negative grey scaling.

Only: £12

VIEW

VIEW WORDPROCESSOR

We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEW SHEET (Acornsoft)

£49

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £9

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Only £8

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 EB 50 and converted typewriters EX43/44 & 55.

Only: £8

BEEB PRINTER ROM



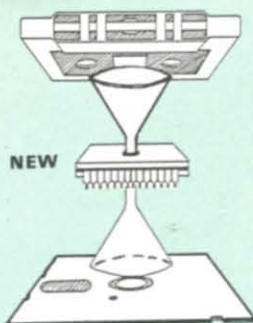
This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

- ★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.
- ★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.
- ★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.
- ★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.
- ★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LPV11/DMP100, DMP200.
- ★ Operates with either parallel or serial interfaces.
- ★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

TRANSFEROM

(Tape to Disc Utility)



The only TAPE to DISC Utility ROM that works with our Double Density Disc Interface.

After months of top secret development, we are now able to supply details of this advanced and sophisticated utility ROM for the BBC micro. Just look at the features:

- Fully menu driven for ease of use
- Copies with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

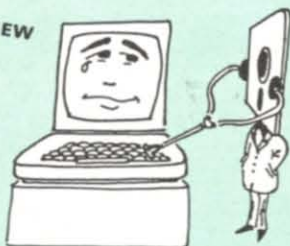
TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required - Single or Double Density.

£22.00

DIAGNOSTICS DISC

NEW



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

Continued

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £15.00

ROMAS THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!



ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referencer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at... Only £45

Please specify 40 or 80 track disc when ordering.

ADE

"Systems" complete program development package in a 16K ROM. We are now supplying the new 6502 2nd processor compatible version.

SPECIAL OFFER ONLY £43

ULTRACALC 2

The mark 2 version of the BBC Publications' extremely popular electronic spreadsheet ROM.

Only: £66

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only £20

BEEBMON

Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

BEEBMON is the most powerful and versatile machine code monitor from Watford Electronics. BEEBMON offers some superb features specially designed to make the task of understanding and debugging machine code easier; indeed BEEBMON is probably the only product with sufficient power to aid in the debugging of such complex pieces of software as a DFS. Offering a total emulation mode, BEEBMON can be used to single step through code anywhere in memory. All breakpoints are emulated and the workspace is totally relocatable, allowing for the simulation of all those "awkward" pieces of code.

Superb value for money at only:

£24

DISASSEMBLER ROM

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.

ONLY £18

Please write in for technical details.

ROM MANAGER

"Provides comprehensive management of all your installed ROMs - BEEBUG Nov. '84". This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself. ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.

The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

Price £20

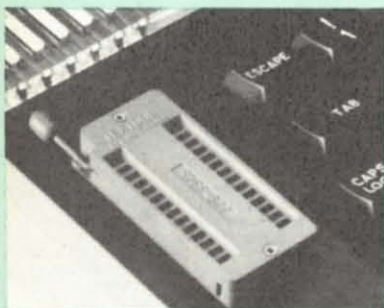
DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your programs from cassette to disc. It copes with 'locked' files and full length adventures (up to &6E blocks long) and programs that load below &E00. Disc Executor is simple to use and provides menus to prompt the user along the way. Disc Executor will cope with the vast majority of tapes. (Please note that Disc Executor is not compatible with double density disc interfaces - keep reading our adverts though!)

Price only £10

(Please specify whether 40 or 80 track disc when ordering)

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort - no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

- Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.
- The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY £15

Nightingale Modem

Now Watford brings you PACE's NIGHTINGALE MODEM PACKAGE including the popular Commstar ROM software for the BBC Micro. Nightingale is considered to be by far the most versatile BT approved modem available at the price for the BBC Micro. It is ideal for home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) as well as 300/300 baud full duplex for communication between BBC and other computers, including bulletin boards. A bargain at our

SPECIAL INTRODUCTORY OFFER

(Price includes
COMMSTAR ROM &
comprehensive manuals)

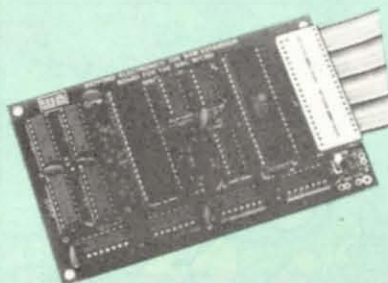
£119

Nightingale Modem without software	Only £99
COMMSTAR ROM package only (P&P on modem £2.00)	£29
Auto Dial/Auto Answer Board	£48
Auto Dial Utilities Disc	£9.50
OBBS Bulletin Software	£20.00

DEMON Modem Package

Price: **£69.95** (Carr. £3)
Auto dial software disc **£4.25**
(Please specify 40 or 80 track)
(Note: Demon is not BT approved)

32K RAM- PRINTER BUFFER EXPANSION BOARD



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer - type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- In "VIEW", type in letters in 80 columns and have up to 28,000 bytes free - 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This superb product is recommended by Computer Concepts for use with both Wordwise and Wordwise Plus. We wholeheartedly agree with this commendation.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc).

- Ensure COMPATIBILITY with a vast range of hardware (including Watford & ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable.

- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages.

Offer price
Only: £60

(Price includes a comprehensive manual and the ROM)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles:

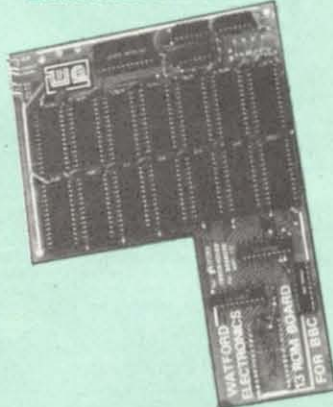
It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V - press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.

You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.

A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

ONLY £32

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered - On board battery back-up facility - will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead). Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer.

Supplied ready-built and tested complete with fitting instructions.

Only £30

PCB NI-CAD Battery for ROM Boards.

£2

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28
INTER-SHEET	£48
INTERCHART	38
TERMI	£27
COMMUNICATOR	£58
SPEECH ROM	£25

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

WORDWISE PLUS

Now available from stock **£47**

WORDWISE PLUS UPGRADES

Existing users of Wordwise can upgrade to WORDWISE + for **£19**. Please return the old WORDWISE package complete with Chip and MANUAL with your remittance and we will send you the new WORDWISE + package.

NEW
LAUNCH

Word-Aid

The most comprehensive utilities disc for Wordwise-Plus

Take advantage of the programming language in Wordwise-Plus. Simply load the disc with Shift-Break and have the power of these sophisticated new features instantly at your fingertips.

Features:

- Mail Merger
 - Can use Data files spooled from Wordwise-Plus.
 - Can use Data files from most databases.
 - Powerful Label printing facilities.
 - Mail merges with names, addresses etc. inserted into a standard letter.
- Address Finder
 - Search for names.
 - Search for addresses.
 - Insert names into text.
 - Insert addresses into text.
- Print/Preview continuous files.
- Chapter Marker.
- Search and Display.
- Remove embedded commands.
- Text transfer.
- Printer Codes - make embedding commands easier.
- Utilities supplied compressed for speed.
- Utilities supplied annotated for help.
- Supplied on 40/80 format disc.
- Very user friendly.
- Recommended by Computer Concept.

Introductory Offer: **£12**

(Further details available on request SAE, please).

THE AMX MOUSE

The AMX Mouse needs no introduction. It is simply the best.



ONLY: £68.50

We are giving away the sophisticated **COLOUR ART** Software package **ABSOLUTELY FREE** with every purchase of the AMX Mouse from us.

AMX Desk package	£19.00
AMX UTILITY package	£11.50

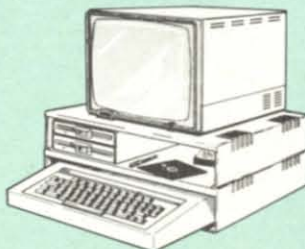
COLOUR ART

This novel program allows you to add COLOUR to any drawing produced with your AMX Mouse package, and really bring those pictures alive. Not with just any colours, mind you, but a full range from up to 255 different shades! It's simplicity itself to use this "painting by numbers" painter to create simple, striking and powerful images to please the eye.

Special Offer: **£10** (£7 carr.)

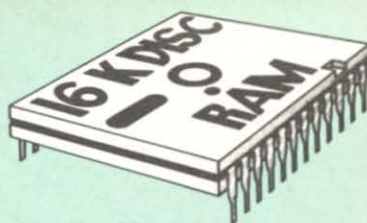
(please specify 40 or 80 track disc when ordering)

PLINTHS FOR BBC MICRO AND PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) If the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	£11 (carr. £1.50)
DOUBLE BBC PLINTH	£19 (carr. £2.00)
PRINTER PLINTH	£10 (carr. £1.50)



This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- All existing ROMs can be stored on disk and used in DISC RAM.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £32

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £35

Continued



BOOKS (No VAT on Books)

21 Games for the BBC Micro	£5.95
30 Hour BASIC (BBC Micro)	£6.95
35 Education Programs for BBC	£6.95
100 Programs for BBC Micro	£6.95
6502 Assembly Language Program	£13.95
6502 Assembly Language Subroutines	£19.95
6502 Machine code for Humans	£7.95
68000 Assembly Lang. Programming	£19
A young persons guide to BBC Basic	£4.50
Advanced Machine Code Technique for BBC	£7.95
Advanced Programming for the BBC Micro	£6.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Advanced 6502 Programming	£12.45
Assembly Language Programming on BBC Micro	£7.95
Advanced Programming Techniques for the BBC Micro	£7.95
Applied Assembly Lang. for BBC	£7.95
Assembler Routines for the 6502	£
Assembly Language Programming FOR the BBC Micro	£8.95
Assembly Programming made Easy	£5.95
Basic ROM User Guide	£9.95
BBC BASIC for Beginners	£7.95
BBC BASIC	£5.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Machine Code Portfolio	£7.95
BBC MICRO add on guide	£6.95
BBC Micro An Expert Guide	£6.95
BBC Micro Assembly Language	£7.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Games Master	£5.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro ROM Book	£9.95
BBC Micro ROM PAGING System Explained	£2.00
BBC Micro Revealed	£6.95
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£6.50
BBC User Guide	£10.00
BBC Wargaming	£8.95
Basic Programming on BBC Micro	£5.95
BCPL User Guide	£5
Brain teasers for BBC micro	£5.95
Business Applications on BBC	£7.95
Computing for All the Family	£6.45
CP/M Bible	£16.00
CP/M Handbook with MPM	£13.95
CP/M Soul of	£14.95
CP/M The software BUS	£8.95
Creative Animation & Graphics	£7.95
Creative graphics on BBC Micro	£7.50
DISC FILING SYSTEM (DFS)	
Operating Manual for BBC	£6.95
Disc Programming Techniques	£7.95
Disc System for the BBC	£8.95
Discover BBC Machine Code	£6.95
Discover FORTH	£13.95
Easy Programming for the BBC Micro	£5.95
Electron Machine Code for Beginners	£6.95
Exploiting BBC Basic	£6.95
Exploring FORTH	£6.95
Filing System & Databases	£7.95
Further Prog. for BBC Micro	£5.95
FORTH on the BBC Micro	£7.95
Forth Programming	£14.40
Functional Forth for the BBC Micro	£5.95
Games BBC Computer Play	£6.95
Getting more from your BBC & Electron	£6.95
Graphics for Children	£7.95
Graphs & Charts on BBC Micro	£7.50
Graphic Art for BBC Computer	£5.95
Hackers Handbook	£4.95
Handbook of Procedure & Functions for the BBC Micro	£6.95
Interfacing Projects for the BBC	£6.95
Introducing the BBC Micro	£5.95
Introducing LOGO	£5.95
Introduction to FORTH	£8.95
Introduction to PASCAL	£14.95
Let your BBC teach it to program	£6.45

LISP	£9.25
LISP, A Beginners Guide to	£10.95
LISP Cassette	£15.50
Logo Programming	£8.95
Mysteries of DISC DRIVES and DFS REVEALED	£5.95
Mastering CP/M	£16.50
Programming the 6502	£13.95
Programming the BBC micro	£6.95
Programming the Z80	£16.95
Programming with Graphics	£5.95
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Complete Programmer	£5.95
The Epson FX/KAGA PRINTER Commands REVEALED	£5.95
Using Floppy Discs with BBC Micro	£5.95
Using BBC Basic	£6.95
Wordstar & CP/M made easy	£6.95

NEW

LAUNCH

BEEB VIDEO DIGITISER

THE LATEST IN HIGH TECH FROM WATFORD

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

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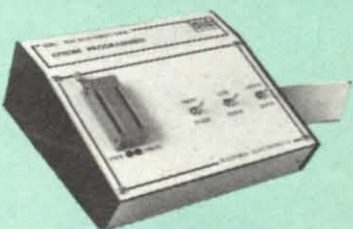
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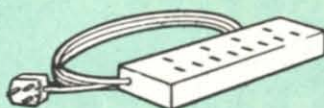
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PETER Killworth, the author of three of the best-selling adventure games on the BBC Micro, has also written a book, *How to Write Adventure Games* (Penguin - Acorn), intended for "those who would like to create their own adventures". So what's it like?

The first thing to ignore is the hyperbolic blurb - not his - on the back cover that this is "the complete book on the subject".

It's no more complete than James Burke's view of the cosmos - and what you actually, and can only, get is the author's philosophy, methods and prejudices. Fortunately Killworth's are interesting and informative.

The style is chatty and introspective - "I was living the game. The machine was providing me with ... descriptions of areas, objects, disasters, etc., plus some funny jokes at my expense. I could see the caves I was exploring in my imagination".

Imagination is the key word in the book. Killworth obviously has one, plus the ability to program his ideas - an unusual combination because, in order to create an imaginary world you have to, at some stage, concentrate on the boring, mundane trees, and this requires two different types of thinking.

Killworth's method is to build a shell or library of general utilities to handle all the common or cave activities such as moving from room to room, getting and dropping objects, message generation - what can be seen, the result of any plausible action and so on - and the lexical, syntax and semantic checking of commands.

The approach is quite familiar to the professional compiler-cum-database-programmer, and the shell, once written and checked, allows the writer to concentrate, at a much higher and creative level, on the essential - the plot that makes or breaks a game.

The main example given is the discussion and implementation of a quite large and complex game called Roman. I doubt if many people would have the patience to type it in, but all the examples are also available from Acornsoft. The point is that, given the shell, you only have to alter the database in order to create your own game.

The listings and techniques are, however, very BBC specific - this is not a criticism since you are given some interesting details about the BBC Micro and how to use the limited memory efficiently. Nevertheless a "complete" book would have to consider how to

Roman road to creating adventures

transport the techniques and games on to a variety of machines.

My main objection is that the shell must always impose limits on the type of problems that can be set - often to a "chain". An example in the book is get CHEESE to get MOUSE to get CAT to get CHICKEN which, when sacrificed, allow you to loot a temple and get BUST.

Almost the only general principle that can be handled is dropping objects to map mazes - a puzzle that is boringly overworked. Killworth likes mazes, but, thankfully, always invents a new twist.

The shell is therefore useful, indeed necessary, for accurately generating many puzzles - but it cannot, for example, easily create and handle Quasimodo's bell-ringing problem which I set in the August 1984 issue of *The Micro User* in which, no matter how many ropes were involved, a solution could always be obtained in three up and down moves. In short, a principle was involved which, once understood, enabled the player to solve any random configuration.

I don't know how to incorporate such problems into an adventure shell, so again this is not a criticism. In fact Killworth, in his final chapter, does consider that at least one well-designed puzzle which can only be solved by understanding rather than looking at the listing, is essential for a good game.

First the puzzle should be obvious - the player should know what he has to do and what objects are available, no guessing of esoteric verb noun combinations, digging everywhere or searching in all directions for hidden exits.

Killworth's particular example involves climbing a cliff via a long horizontal

plank that is pivoted close to one end.

The player can only walk along all the "rooms" on the plank provided he has balanced them with sufficient weights - a simple law of physics which hopefully, on realisation, will create that Eureka feeling in the player and make him eager to go on to the next puzzle.

Still roamin

IN order to illustrate a principle that could be handled by a shell, consider the Duneroamin puzzle I set in the March 1985 issue of *The Micro User*. No one has, apparently, managed to solve this, so I will not give the answer but merely re-state the puzzle with a few hints.

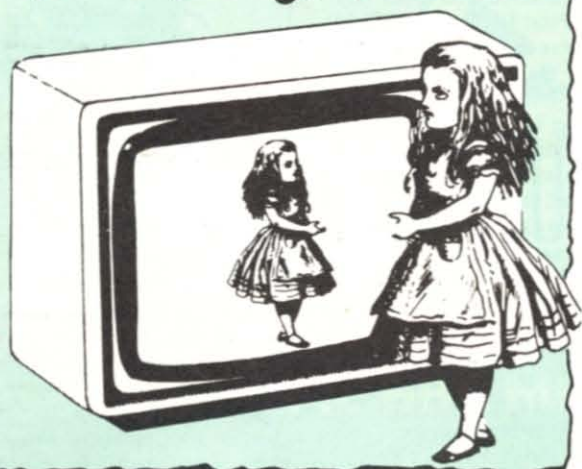
The objective is to rescue the survivor. To do this you must circumnavigate a planet which is 40,000 km in circumference. To begin with you have 23 cans of fuel, each of which can refill the tank of a vehicle that can carry just one can and travel 8,000 kms on a full tank.

You start with half a tank. Obviously you drop one can 2,000 km west, then - not so easy - drop one can 4,000 km east and another 12,000 km east.

You should now be at the starting point with 10 cans of fuel. This is sufficient for you to travel west, find the survivor and return to base safely.

The principle is to build fuel dumps and the eureka is to realise that you must build them to the east before

Alice through the VDU



Our monthly foray into Adventure games

setting off to the west – it is quite impossible to travel round the planet in just one direction all the time.

A slightly easier problem – I think – is that, given N cans of fuel, just how far can you travel in just one direction – given that, as before, you only refill the tank when it is empty? Obviously if $N=1$ then 8,000 km, and if $N=2$ then 16,000 km, but things get tricky at $N=3$.

Another question is – does it help if you can partially refill the tank and keep or dump a partially empty can? I don't know the answers, but anyone who has climbed Mount Everest and jumped off must have worked it out.

Island worth a visit

EMERALD Isle by Level 9 is more like the Isle of Levant, because you start with just a parachute to cover your modesty, but that soon goes. Fortunately the natives don't object to a nudibot, so you can wander into the King's presence in the altogether and the local police station doesn't give a figleaf either.

Actually there are a couple of people who do object, but I spent most of my

first visit in the middle of the beach, because how to launch the canoe had me stumped.

I tried the old check/trick of GET PADDLE and GET OAR but there were none in or out of sight and I couldn't pull, push or carry the thing in to the sea – so open the hints.

Even then I couldn't see how to work it, so I complained to Pete Austin along with the mystery of the vanishing season ticket and how GIVE SILK worked without having the spider's threads.

Only afterwards did it occur to me that Level 9 have a shell system as well and it must be standard to check if you have an object – unlike the CHEESE in Sphinx Adventure. So I've blundered again – and the parachute's vanished. Must crack this game before he gets the letter.

My second mistake was to think that as it only costs £6.95 plus pictures it can't be very big. Emerald Isle is 200+ rooms with complex chaining problems and the hints don't give all the answers.

Anyway, back on the island I eventually dug in, made the canoe slither magically halfway across the beach and into the waterless sea. So I was able to visit nearly everywhere. Trouble was I hadn't got things in the right sequence and had forgotten where I left the shovel.

On my third visit I had my shopping list about right and systematically set up a base for operations on the beach. Neat tricks are that you can move a short way in the dark and the lamp, once assembled, seems everlasting.

Another nice, knapsack feature is that objects have different weights – a scrap of paper will not trigger one trap and I still wonder if I needed to carry the canoe with anchor all the way to balance my options.

Eventually the blessed Margaret's decree was fulfilled and all XX objects had been found, examined – another nice painting by Godfrey – and dumped. The King shook my hand and abdicated without the slightest complaint about the pile of litter I had left on his beach.

I repeat – don't assume because this is £3 cheaper with pictures that it's a small, easy game. Level 9 are always relatively massive in rooms and puzzles compared to the average and this is comparable to their Colossal Cave in size and difficulty.

Finally, having made enough myself, I deliberately tried to find some real errors.

The Level 9 shell can fail with GET EVERYTHING – try it at the bottom of the cliff in Return to Eden – and IN can be ambiguous when there is a canoe AND a cave to choose between.

But, on the whole, the game copes with practically any command and often gives – an important point – some relevant comment rather than just "You can't do that".

Emerald Isle is well worth a visit and there are two more to come in this series.

Mission is murder

ASSASSIN, from Robico Software, is a text compressed, machine code game with characters to kill and umpteen lethal objects to do what a man has to do on a journey through some 220 rooms.

The text input is advanced so you can try to KILL THE MAN WITH THE GUN WITH THE BOMB but I'm not sure what that means and the man with the gun tends to be quicker anyway.

The best feature of this middleweight game is the plot – quite logical and realistic as you emulate 007's licence to kill just about everyone in your search for the evil General Garantz.

You start in a railway station, catch a train and already leave two dead bodies

on the tracks before you reach the next town. Quite a complex place since the backstreets all seem to have similar descriptions, so I missed the Zulu army and consequently cut my throat shaving.

Actually all the Impi gets you is a good night's rest – despite Marlene droning on downstairs – a decent shave and a coded message that gets another coded message that tells you to rendezvous where you have to go anyway.

The tricky bit is crossing the river – I prefer an inflated inner tube when I go swimming ... it's much more buoyant and resilient.

Pity you can't keep it, since the bull in the next field is a pain in the paddock.

Finally should you get to meet the main target – do you kill him with the gun, the bomb or the exploding taperecorder, strangle him with the red rag, hand him with the rope, brain him with the bottle or spanner, burn him alive with a Molotov cocktail or just plain poison him with a British Rail pork pie?

Hidden hacker solution

AFTER being slightly surprised that no one has solved Duneroamin I was very surprised that Peter Derlien of Sheffield managed to solve the Hacker problem, featured in the May 1985 issue of *The Micro User*, in less than a week.

Because Peter is a Kit Williams fan, his answer is hidden in Figure 1. What you have to do is number the hexagons from 1 to 19 and then fit them together so that all 15 rows add up to 38 – that is what the program is testing.

Some readers and Wogan watchers will know that the title of Kit Williams' last book is *The Bee on the Comb* – 19 characters made up from the last letters of the animals hidden in the 15 pictures plus 4 spaces. It is just coincidence that the B of BEE goes in the centre of this magic hexagon and that 3 and 8 are also the number of letters in Kit Williams.

If you can't handle the simple substitution of numbers from now on, all will be revealed next month.

The magic hexagon was first discovered by C.W. Adams after 52 years of shuffling tiles. The truly remarkable thing is that it is the only

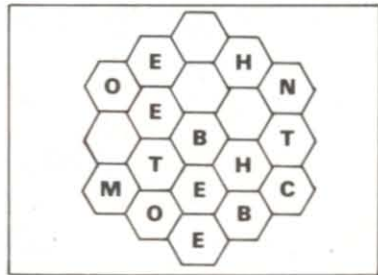


Figure 1

possible pattern and yields, with rotation and reflection, a total of only 12 ways of stopping the Hacker program. Peter found them all in nine hours on a BBC Micro.

A final remarkable fact, for Diaphantine fans, is that there are no other magic hexagons of any size other than the trivial case of just one tile. This merely requires the proof that

$$(9*(N^{**4} - 2*N^{**3} + 2*N^{**2} - N) + 2)/(4*N - 2)$$

– which calculates the required sum of the rows – only has integer solutions, 1 and 38, when N=1 and 3.

Alice

How well do you know your BBC Micro?

1 What does VIA stand for?

2 How many bytes are transferred, per second, at 1200 baud?

3 Three pages of memory are called Fred, Jim and Sheila. Which pages are they?

4 Where in the operating system is the character set stored?

5 What is */ an abbreviation for?

6 Is 4 AND 8, NOT 0?

7 Which VDU command disables all others except one?

8 Which one isn't disabled?

9 Which location contains the current graphics mode?

10 How many registers has the 6502 got?

**THE
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USER**

ADVANCED USER
QUIZ

Answers to last month's quiz:

1. REPORT
2. *; THIS IS A REM
3. SAA5050
4. 8
5. FALSE
6. &7FFFFFFF
7. Bit 5
8. High byte then low
9. Roger (Roger Wilson)
10. 16

Answers next month

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ALL PRINTERS HAVE A 12 MONTH GUARANTEE

DOT MATRIX

LX-80 NLQ — a new low-cost high performance dot matrix printer from Epson. Its many features include Near Letter Quality, Draft mode, programmable characters, a variety of print styles, graphics etc. Supplied with friction feed.

LX-80 £242(a) Optional Tractor Feed £20(c)

JX80 COLOUR — a full colour dot matrix printer with colour text and graphics as well as many advanced printer features. £499(a)

RX 80T + £210(a)

RX 80FT + £220(a)

RX 100 + £345(a)

FX 80 + £315(a)

FX 100 + £430(a)

KP 810 (80 col) £245(a)

KP 910 (156 col) £339(a)

BUFFALO 32K Buffer for EPSON PRINTERS

This compact 32K buffer can be fitted internally on any EPSON printer within a few minutes. It does not require external power or any modification to the printer. It will hold about 15 A4 pages of text freeing your computer for other jobs in a fraction of the time it would normally have to wait for the printer to finish all that printing. Supplied with full fitting instructions. £99(d)

DAISY WHEEL

BROTHER HR15: • 14 cps • 3K Buffer • Two colour printing • Proportional spacing • Underline • Bold • Shadow print • Super/Sub script + many other features.

BROTHER HR15 £315(a)

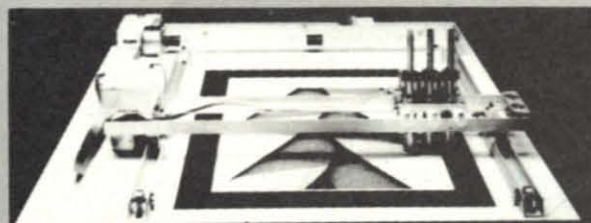
JUKI 6100: • 15 cps • 2K Buffer • Switchable 10/12/15 cpi • Proportional printing • Linear Motor for max reliability.

JUKI 6100 £310(a)

GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without losing the accuracy. The servo controlled drill/router, and scribe can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs. Workstation comes complete with all accessories.

Workstation Complete £490(a)



Basic Plotter £270(a)

Opto Sensor £72(c) Drill/Router Attachment £79(c)

Power Supply: PS12V £42(c) PS24V £78(c)

Scandump Utility Disc £14.95 (d)

TECHNOMATIC

All prices exclude VAT

PRINTER ACCESSORIES

EPSON

FX80 plus sheet feeder £129(b)

Paper Roll Holder £17(d) FX80 Tractor Attachment £37(c)

Interfaces: 8143 RS232 £28(c); 8148 RS232 + 2K £57(c)

8132 Apple II £60(c); 8165 IEEE + Cable £65(c)

Serial & Parallel Interfaces with larger buffers available.

Ribbons: RX/FX/MX80 £5.00(d); RX/FX/MX 100 £10(d); LX80 £6(d)

FX80 Dustcover £4.50(d); LX80 Tractor Unit £20(c)

Spare pens for Hi80 £7.50/set (d)

KAGATAXAN: RS232 Interface + 2K buffer £78(c); Ribbon KP810/910 £6(d)

JUKI: RS232 Interface £65(c); Spare Daisy Wheel £14(d); Ribbon £2.50(d);

Sheet Feeder £182(a) Tractor Feed Attach £129(a)

BROTHER HR15: Sheet Feeder £189(a) Ribbons Carbon or Nylon £4.50(d)

Tractor Feed £99(a)

BBC Printer Lead: Parallel (42") £7(d); Serial £7(d)

Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine perforation (Clean Edge):

2000 sheets 9.5" x 11" £13(b); 2000 sheets 14.5" x 11" £18.50(b)

Labels per 1000s: Single Row 31" x 1 7/16" £5.25(d)

Triple Row 2-7/16" x 1 7/16" £5.60(d)

EPSON HI-80 PLOTTER

EPSON technology has once again scored a first by introducing a sophisticated A4 size plotter that does not need specialised software or programming skills to operate it and yet keep the cost within the reaches of all computer users. Features include 4 pens at a time — upto 10 colours to choose from, a variety of pen nibs, high speed plotting. Powerful software command codes include single commands to plot circles, ellipses or triangles. Line or bar graphs and pie charts can be plotted in a variety of exciting styles very simply by keying in the data into the computer. Detailed leaflet on request. £399 (a)

PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

TSB 64 Buffer/Sharer £199 (a)

BBC Cable Set £30

PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No external power input required.

All lines on the sharers are fully switched (36 on parallel and 25 on serial)

	Parallel	Serial
3 Computers to a Printer	36V36-3 £69(c)	25V25-3 £64(c)
4 Computers to a Printer	36V36-4 £85(c)	25V25-4 £74(c)
2 Computers/2 Printers X-over	36V36-X £69(c)	25V25-X £69(c)
BBC Cable Set 3 to 1 (1m ea.)	£32(c)	£34(c)
BBC Cable Set 4 to 1 (1m ea.)	£39(c)	£41(c)

Computer Sharer:

1 computer to 2 printers fitted with Cable for BBC TCS26 £19.50(c).

BREAK-LOCK

A two-position key switch, fitting into the 'Ash-tray', that prevents accidental/unauthorised use of the Break key. £8.50(c).

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Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

MONITORS

All monitors supplied with BBC lead

MICROVITEC

All 14" monitors now available in plastic or metal cases, please specify your requirement.

14" RGB

with PAL & Audio

1431 Std Res	£185(a)	1431 AP Std Res	£205(a)
1451 Med Res	£240(a)	1451 AP Med Res	£280(a)
1441 Hi Res	£389(a)	These monitors can receive TV programs thru a Video Recorder	

Swivel Base for Plastic 14" Microvitecs £20(c)

20" RGB with PAL & Audio

2030CS Std Res	£380(a)	2040CS Hi Res	£685(a)
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KAGA TAXAN 12" RGB

VISION II Hi Res	£225(a)	VISION III Super Hi Res	£325(a)
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SANYO CD3125NB 14" RGB Std Res £159(a)

MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12" Green Screen	£95(a)
KAGA KX1201G Hi Res 12" Etched Green Screen	£99(a)
KAGA KX1203A Hi Res 12" Etched Amber Screen	£105(a)
PHILIPS BM7502 12" Hi Res Green Screen	£75(a)
PHILIPS BM7522 12" Hi Res Amber Screen	£79(a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21(c)
Monitor Plinth for the BBC	£13.50(b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50(b)
BBC Leads Kaga RGB £5(d) Microvitec £3.50(d) Monochrome £3.50(d)	

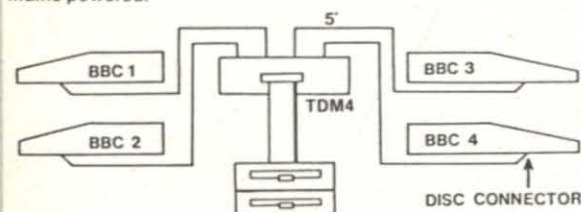
TOUCHTEC-501

Designed for use with Microvitec metal cased monitors, and using the RS-423 socket, this unit brings genuine touch-screen operation to your BBC. Ideal for the educational market. Supplied with a users handbook and utilities disc containing starter programs and development software.

£260(b)

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected to one dual will allow 8 computers to share 1 drive. Units are supplied with 5' of cable per outlet as standard. Mains powered.



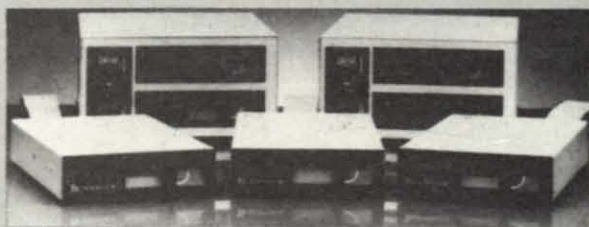
TDM4 Quad Unit (up to 4 computers)

£135(a)

TDM2 Dual Unit (2 computers)

£75(b)

DISC DRIVES



TECHNOMATIC drives are fitted with high quality slimline Mitsubishi mechanisms and represent the state of the art in drive technology. The drives are built to the highest standards and are tested to their full performance capability before packaging.

Single drives are available with or without integral mains power supply. The dual drive power supplies are switch mode type and are generously rated to ensure minimum heat generation even over long periods of operation. All drives with integral power supply are fitted with a mains indicator.

The drives are housed in attractively designed metal casings painted in hard wearing BBC matching paint. The dual drives can be supplied in stacked version or with built-in plinths. The plinth version cases are of sturdy construction to carry any monitor and provide a simple method of having a compact computer installation.

The 80T drives are supplied with the 40/80 track switching modules at no extra charge. The 40/80 track switches are conveniently positioned in the front on dual drives to enable easy switching between the tracks.

All drives are supplied with all the necessary cables, manual and a formatting disc. The mains powered drives are also fitted with a 13A mains plug suitably fused. The drives are ready to be fitted to the computer. All drives are capable of operating in single or double density modes.

Single Drives:

1 x 100K 40T SS	: TS100	£85(b)
1 x 400K 80/40T DS	: TS400	£125(b)

With integral psu:

PS100	£120(b)
PS400	£145(b)

Dual Drives: (with integral psu)

Stacked Version:	
PD200 2 x 100K 40T SS	£190(a)
PD800 2 x 400K 80/40T DS	£265(a)

Plinth Versions:

PD200P	£215(a)
PD800P	£289(a)

Note: We can supply drives with Shugart mechanisms at considerably lower prices. Please phone for details.

3.5" Drives:

These compact drives, used with most of the new 16 bit micros offer fast access times and high performance with minimum of power consumption. The mechanisms are 80 track double sided and are capable of both single and double density operation. The single drive is offered in a dual case with a blanking plate for future upgrading. The drives come complete with cables, manual and formatting disc.

TS35 1 x 400K 80T DS £99(b)

TD35 2 x 400K 80T DS £175(b)

3M FLOPPY DISCS

Authorised Distributor Data Recording Products



Industry standard high quality discs with guaranteed error free performance for life. Discs in packs of 10:

40T SSDD £13(c)	40T DSDD £18(c)
80T SSDD £22(c)	80T DSDD £24(c)

3½" discs. Pack of ten £38(c)

FLOPPICLENE DRIVEHEAD CLEANING KIT

The FLOPPICLENE drive head cleaning kit is an ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminates the risk of contamination and abrasion of sensitive driveheads. These risks are normally inherent in the reusable drivehead cleaning kits. Floppiclene with 20 disposable cleaning kits. £14.50(b)

DISC ACCESSORIES

Single Disc Cable £6(d)	Dual Disc Cable £8.50(d)
10 Disc Library Case £1.80(d)	30 Disc Case £6.00(c)
Lockable Storage Boxes 40 Discs £14(c)	100 Discs £19(c)

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TECHNOMATIC

COMMUNICATIONS

MODEMS

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as Intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered £62(c) BBC Lead £6 External PSU £9(c)

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21, V23, (BELL 103/113/108 outside the UK) and including 75,300,600, 1200 Baud ratings. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto/dial/auto-answer makes this modem unique. WS2000 £129(c) BBC Serial Cable £7.



WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line £30(d).
BBC User Port cable (for modem control) £7.

SKI KIT (Allowing total control of the modem by your computer) £10.

DS1 Disc (for Commstar): When used with the Auto-dial card, SKI Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers and protocols or autodialling £10.

WS2000 Auto-Answer Card £30(d).
(Please note that the A/D & A/A Cards are still awaiting BAPT Approval.)

DATA-BEEB An advanced communication ROM from Miracle Technology. Its many features include both Viewdata (Prestel) and Terminal modes, Auto-Answer and Auto-dial for fully expanded WS 2000's etc. Macro facilities allow flexible use of its many facilities e.g. automatic dialling, log-on, going to a specific page, printing it, and going off-line, all in one operation. £25(d).

NEW WS3000 SERIES — a new range of microprocessor based modems, offering speeds of up to 2400 baud full duplex. Features include: 'Hayes' protocol compatibility, Auto-Answer, Auto-Dial, speed buffering, printer port, data security option, etc.

WS3000 V2123 (V21 & V23) £295(a)

WS3000 V22 (as above plus 1200 baud full duplex) £495(a)

WS3000 V22bis2400 (as above plus 2400 baud full duplex) £650(a)

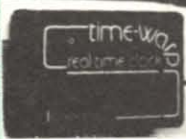
COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. Any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time clock. £27(d)

TERMI-II A good general purpose communications package for bulletin boards, electronic mail etc. (Not for PRESTEL) £26(d)

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). £57(d)

'TIME-WARP' REAL-TIME CLOCK CALENDER

We have broken the price barrier! A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calendar, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as Extensive software on cassette (easily transferred to disc) — no ROMs needed. £29(c)



TECHNOMATIC

All prices exclude VAT

EPROMER II



A sophisticated eprom programmer that handles the full range of popular single rail eproms (incl 27256) and allows the user full control of the programming process.

Its powerful menu driven software makes the programming of eproms simple, efficient and eliminates the need to have fiddly switches for selecting eprom types, programming voltage or method. The features include:

- Integral power supply ensures no power drain from the computer.
- Interfaces through 1 MHz bus, fully buffered.
- Clear and simple instructions displayed on the screen make the programming easy for both the first time user and the advanced user.
- Eproms upto 16K (27128) programmed in single pass.
- Selectable programming voltage 25V/21/12.5V
- Selectable programming method — normal or high speed algorithmic. High speed programming enables 27128 to be programmed in just over 2 mins. Normal programming skips addresses with FF data to increase programming speed.
- Automatic verification on completion of programming.
- User can select any section of the eprom from a single byte to its full address range to Blank Check/Read/Program/Verify enabling program development/changes very simple.
- Full screen editor with HEX/ASCII input.
- Full tape/disc filing facility. Data input from keyboard/Tape/Disc/Eprom.
- Constant display of all options selected.
- Several BBC BASIC programs can be entered on a single eprom.
- Checksum facility allows for easy identification of programmed roms.

EPROMER II with Manual & Cassette £99(b) Software on disc £3 ROM based software £10

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. £59(b).

UV1B as above but without the timer. £47(b).

ROM/RAM EXPANSION SYSTEMS

COMPUTER VILLAGE ROM/RAM BOARD: A beautifully designed expansion board, simply plugs in — no soldering. (Fits into 6502 and Video ULA Skt.). Fully buffered with 16 paged Rom capacity. Option of 16K paged Ram, with software initiated write protect — battery backup is included. It allows nine different ROM/RAM configurations. £43(c)

ATPL SIDEWAYS ROM EXPANSION BOARD: A well constructed expansion board, simple to instal and requires no soldering. All buses are buffered. It allows full sideways rom expansion to 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K CMOS RAM. Battery backup option allows data retention in the RAM when the computer is switched off. Several link selectable options including write protect for the RAM. ATPL Board £39 (d) Battery Backup Kit £18 (d).

RAMROM-15: The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. £86(b).

ARIES B-12 Board £40 (d)

ARIES B-20 Board £78 (d)

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RB2 TRACKER BALL

A precision built tracker ball. Software allows RB2 to function, instead of cursor keys, for word processing, CAD/CAM etc. Software includes a graphics/CAD package.

RB-2 (with 'microdraw'). £52 (b)
RB-21 (with 'icon artmaster'). £60 (b)

AMX MOUSE

This sophisticated mouse has many advanced features such as Icons, Windows etc. The supplied 'AMX ART' is a superb, yet simple-to-use CAD package allowing the creation of amazing graphical designs. A screendump for drawings is included. It can also be used with Wordwise/View to replace the cursor keys. Supplied complete with CAD Package, ROM and full instruction manual. £69 (b)

AMX DESK — An organisational program, including memo-pad, telephone/address book, diary, alarm, calculator etc. On Disc. £22(d)

AMX PAINTBOX £13(d)

AMX UTILITIES — provides new drawing facilities including Zoom, colour sketch and more. On Disc. £13(d)

ACORN TELETXT ADAPTOR £192(a)**ACORN IEEE INTERFACE**

This interfaces enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. £282(a)

GEMINI DATABASE MANAGEMENT SYSTEM

Features include • almost unlimited file size (max 10Mbyte) • supports up to 4 drives • Max of 5000 records per file • max 6K record size • max of 62 fields • generates form letters from records. Please ask for leaflet. £68(c)

VIEWSTORE: An exciting, powerful database with many features: Display can be 'spreadsheet' or 'card-layout' type. Powerful selection and sorting utilities. Any screen mode can be used. Data can be sent to View and ViewSheet. Maximum file size 4096MByte. Maximum record size 60K. £52(d)

STARdataBASE: A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. Its printer configuration suits any BBC compatible printer. £69(d)

CLARES BETABASE £18(d)

MASTERFILE II: The new version of the popular general purpose file management system. It allows large amounts of information to be stored and processed. It is extremely powerful yet flexible to use. The disc version allows up to 17 fields per record, and the only limitation as to the number of records is the capacity of the disc. Typically, using 5 fields, about 2000 records may be stored on a 100K disc. This latest version features many new facilities including use with WORDWISE/VIEW £16.50(d) Disc (80 or 40T).

**CP/M SOFTWARE FOR TORCH
Z80 ACORN Z80 PROCESSOR**

We can now supply almost any CP/M based software package in a format suitable for the Torch Z80 and Acorn Z80 second processors.

WORDSTAR PROFESSIONAL: The advanced word processing package comprising of WordStar, MailMerge, StarIndex and SpellStar, a total combination offering substantial savings on individual prices. WordStar is the best selling word processing program on the market. Extensive operator aids include a comprehensive yet friendly manual, step-by-step training guide, command cards, on-screen menus with four levels of help messages etc. etc. SpellStar checks text files against its 20,000 word-plus dictionary. You can both add to the dictionary and create specific supplementary ones. Mailmerge is ideal for mailing applications where lists are selected on a range of criteria. It enables the fast production of personalised form letters, mailing labels, invoices, etc. StarIndex creates alphabetical indexes, tables of contents, paragraph numbering and much more.

WORDSTAR PROFESSIONAL £310(a)

WORDSTAR £275(a) MAILMERGE £145(a)

Dbase-II: Undoubtedly 'The Database', can be used for an almost limitless number of business applications, ranging from mailing list preparation and maintenance through to running accounting ledgers and payrolls. In addition to standard database features it provides much more. An on-disc tutorial takes you from setting up a simple file all the way through to setting up custom screens and reports. Automatic calculations may be performed on data, and fields or entire databases may be modified or replaced with single, English-like basic commands; Dbase-II can therefore be used by general personnel having no programming knowledge. It can be tailored to suit a variety of professions and individual needs, with files such as accounting, payroll, time billing, job costing, scheduling and mailing lists. It can access several files at a time. It is fast, flexible and powerful. £335(a)

SuperCalc-2: A powerful decision making tool which helps to solve complex 'What if...' financial modelling and forecasting questions. With a working area of 63 columns and 255 rows, Supercalc 2 takes full advantage of colour and full memory. It allows consolidation of different spreadsheet files, sorting, a wide choice of formats. Full documentation with easy to follow lessons and single key commands make the use of Supercalc2 very easy. Separate windows provide for display of results and formulae simultaneously. Calendar and date calculations simplify calculations on loan repayment and periods. £180(a)

Pro-Pascal: A full implementation of the International Standard for Pascal (ISO 7185) apart from the optional conformant parameters feature. In addition to the standard features of Pascal, Pro Pascal includes: dynamic strings for character and string manipulation, 9 digit integers and random access file handling for data processing applications, single and double precision floating point arithmetic, an assembler level interface for systems programmers, and separate compilation of program segments for building libraries of commonly used procedures and enabling very large object programs to be constructed. Pro Pascal is a 3 pass compiler, converting a source program into efficient Z80 machine code. The package includes a compiler, run-time library, link editor, library manager and cross referencing utility. £220(a)

BSTAM: A telecommunication facility used for transmitting any size CP/M file. £165(b)

Other packages available include CIS-COBOL, INFOSTAR, FRIDAY, DMS+, FMS, SAGE, ATI TUTORIALS, MACRO-80 etc. Please telephone with your requirements.

TORCH GRADUATE SOFTWARE

We are able to supply most popular software packages including: FRAMEWORK, WORDSTAR, WORD, EASY-WRITER, Dbase-II & III, LOTUS-123, VISICALC, SAGE etc. Please telephone with your requirements.

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ROMs/SOFTWARE

WORD-PROCESSORS

VIEW Acorn's new version V2.1 word processor rom. Advantages include printing straight from memory and editing in any mode. £40(c)

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. £52(c)

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. £13(d)

WORDWISE One of the most popular word processors for general use £34(d).

WORDWISE PLUS The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. 49(d)

SPELLCHECK-I £15(d)

SPELLCHECK II A ROM based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17,000 words on 100K drive. Fully compatible with 6502 second processor. 24.50(d)

SPREADSHEETS

VIEWSHEET Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. £48(d)

ULTRACALC 2 This enhanced version of the original BBC Publications popular spreadsheet ROM includes many new features including full compatibility with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normality found in well designed spreadsheets. £45(d)

INTERSHEET The new spreadsheet from Computer Concepts. Many advanced facilities including 105 character display, several spreadsheets may be used at once, may be used with View & Wordwise etc. etc. £49(c)

INTERCHART Graphics Package £38(d)

LANGUAGES

6502 DEVELOPMENT PACKAGE A Macro-Assembler with utilities for use with the 6502 2nd Processor. Enables the serious programmer to develop large programs in assembly language. £43.35(d)

ISO-PASCAL Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £60(c)

ACORN LOGO A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. £60(b)

BCPL A full implementation of the BCPL compiler language consisting of the language ROM, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. £52(b)

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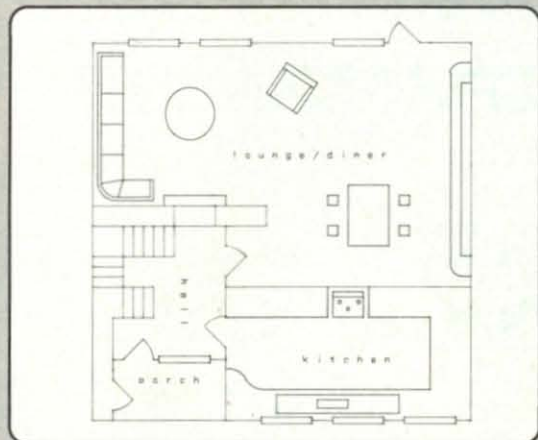
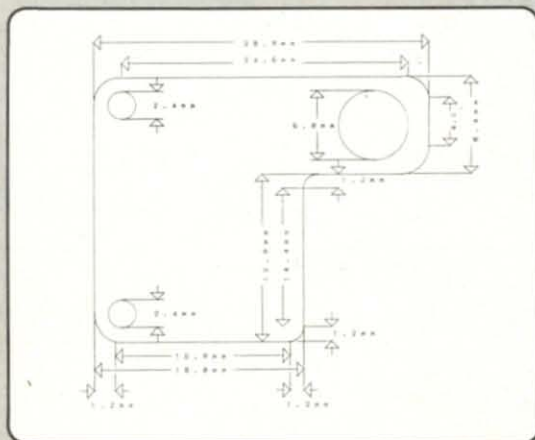
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Goodness, gracious...



PROFESSOR Tesla has just succeeded in creating ball lightning in his laboratory using a large generator.

However the unfortunate man has let some escape, and it is your job as his assistant to recover it.

To succeed you must direct it into a safe container mounted in the wall. The ball can be deflected using electric barriers, but those placed too close together or too close to any other object will be destroyed if the ball hits them.

Ball lightning is made up from alternate layers of charge, like an onion, the outer layer which decays.

If this reaches zero the normally stable state of the affairs becomes decidedly unstable and it explodes, resulting in your sudden death.

Running into the barriers or being hit by the ball can also seriously damage your health.

Your score is calculated according to the remaining charge which decreases

faster as the level of play increases. The better you get, the faster you've got to be!

Keys

*	Up
?	Down
Z	Left
X	Right
Copy	Erect barrier
Delete	Remove barrier
Return	Change barrier's direction

PROCEDURES

defch	Defines characters.
start	Sets up variables for game plus title and keys.
init	Sets all variables for new screen, prints appropriate screen and initiates play.
play	Main loop, checks for keys, moves ball and man, checks for characters hit.
c1(H%,K%)	Returns character at (X,Y) coordinates in C1%.
light	Plots lightning flash.
dead	Checks to see if game is over.
win	Updates variables for next screen.
score	Displays score.
delay(D%)	Delay loop.
exp	Explosion of ball if charge runs out.
hsd	Puts scores in order and displays them.
sc1	
sc2	Code for screens.
sc3	

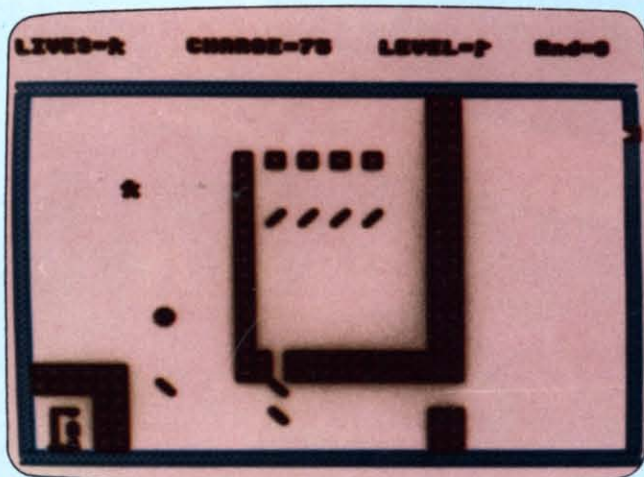
VARIABLES

HC%(5),HCS(5)	Scores, names.
hsd	High score flag.
LV%	Lives.
LEV%	Level.
SC%	Score.
RD%	Number of circuits of screens completed.
X%,Y%	Coordinates of ball.
MX%,MY%	Coordinates of man.
LR%	Left, right (-1, +1) horizontal direction of ball: 0 if moving vertically.
VD%	Up, down (-1, +1) vertical direction of ball: 0 if moving horizontally.
CH%	Change in ball.
C1%	Character returned from PROCc1 (H%,K%).
TX%,TY%	Temporary storage of X,Y coordinates of man.



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tame the lightening released
by a mad professor in
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Ball Lightning listing

```

10 REM*****
20 REM  BALL LIGHTNING *
30 REM  BY N.TUCKER  *
40 REM  (c) The Micro User *
50 REM*****
60 DIMHC$(5),HC$(5)
70 ENVELOPE1,1,0,0,0,0,0,100,-20
,0,0,100,0
80 ENVELOPE2,1,0,0,0,0,0,100,-1,
0,0,100,0
90 ENVELOPE3,1,2,-2,2,5,5,50,-1,
0,0,100,0
100 FORSX=1TO5:HC$(SX)=100:HC$(SX)=
"NEILL.T":NEXT
110 MODE1
120 PROCdefch
130 PROCstart
140 CLS
150 PROCinit
160 PROCplay
170 IFdeadTHENPROCdeadELSEPROCwin
180 *FX21,0
190 PROCdelay(250):PROCscore
200 IFdeadANDLVX<1ANDSCX>HC$(1)THEN
PRINTTAB(5,16)"ENTER YOUR NAME ";:INP
UTHC$(1):HC$(1)=LEFT$(HC$(1),7):HC$(1
)=SCX:PROCsd
210 IFdeadANDLVX<1THENPRINTTAB(9,28
)"Press To Start New Game":SX=BET:BOT
0130
  
```

Turn to Page 142

**when it comes to
upgrading the BBC micro
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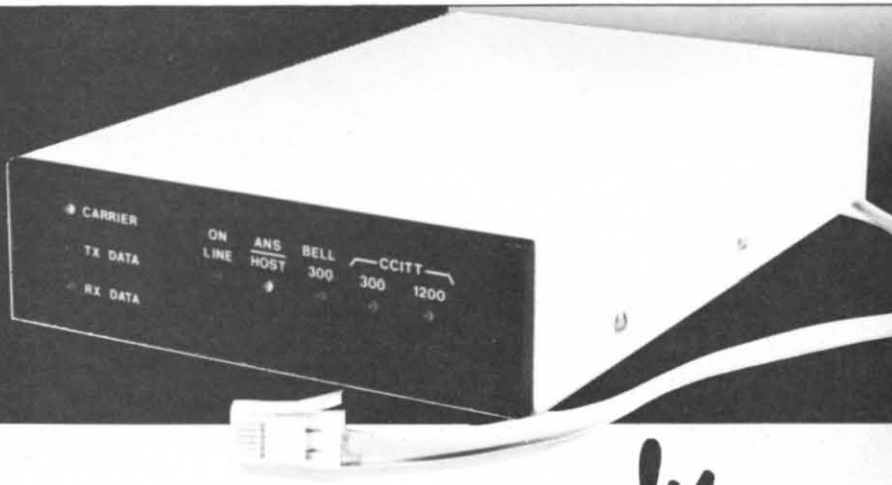
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Making more of Smileys



IF you followed last month's session with the Smileys you should have a listing which matches Program 1 identically.

We can now progress further and make the game a little more interesting.

We need to put in the numbers 0-9 for the X and Y coordinates, over the columns and down the right hand side. We do this with two FOR . . . NEXT loops that use the variables *numx* and *numy* to position the numbers, and print them by subtracting 4 and 7 from them respectively, to create the digits 0-9. The reason I avoided the number 10 here is because it has two digits and would have made the screen untidy.

By the way you can't use PROCwindow because the parameter you wish to print is a numeric variable rather

than a string, and you would generate an "arguments" error when you had to pass it.

Lines 430 and 440 use PROCwindow to print an x and y along the horizontal and vertical axes.

To complete DEFPROCgrid therefore, you need to add lines 410-450.

```
410 FOR numx=4 TO 13:COLOUR 3:PRINT
TAB(numx,5);numx-4:NEXT numx
420 FOR numy=7 TO 16:PRINTTAB(15,numy);numy-7:NEXT numy
430 PROCwindow(2,2,9,3,"x")
440 PROCwindow(2,2,17,12,"y")
450 PROCdelay(2)
```

Run the program as you have it now and you should see on the screen, in

addition to 100 yellow boxes, the numbers 0 to 9 running across the top of the columns, and also down the right-hand side, with a small x and y showing the axes, as in Figure 1.

If your screen differs in any way, check your typing for errors, including all punctuation marks, and most important the semi-colons in lines 410 and 420.

We are now ready to put in the hidden happy smilers. Line 60 calls DEFPROCsmileys starting at line 470 which uses the random number generator to hide 10 Smileys within our array *box* (.).

A FOR . . . NEXT loop first of all places random numbers in the coordinates *smileyx* and *smiley*. Then using line 520 we place 1's in those elements in our array. Line 510 checks to see

```
10 REM Al's Smiley Hunt
20 MODE 5
30 PROCinit
40 PROctitle
50 PROCgrid
55 GOTO 55
60 PROCsmileys
70 REPEAT
80 PROCinput
90 PROCcheck
100 UNTIL smileys>9
110 PROCfinished
120 PROCresults
130 REM*****
140 DEFPROCinit
150 DIM box(9,9)
160 VDU23;8202;0;0;0;
170 VDU23;224,0,126,126,126,126,126,126,0
180 VDU23;225,126,255,153,255,189,1
95,255,126
185 ENVELOPE 1,1,50,-50,0,1,1,0,126
,0,0,-126,126,126
190 ENDPROC
200 REM*****
210 DEFPROCwindow(W,col,wx,wy,A$)
220 COLOUR col
230 IF W=1 THEN VDU28,0,4,19,0
240 IF W=2 THEN VDU28,0,31,19,5
250 PRINTTAB(wx,wy);A$
260 ENDPROC
270 REM*****
280 DEFPROctitle
290 PROCwindow(1,0,0,0,"");COLOUR12
9:CLS
300 turns=1:smileys=0
310 PROCwindow(1,3,2,2,"Al's Smiley
Hunt")
320 PROCdelay(2)
330 ENDPROC
340 REM*****
350 DEFPROCgrid
360 PROCwindow(2,0,0,0,"");COLOUR12
8:CLS
370 FOR boxx=4 TO 13:FOR boxy=7 TO
16
380 PROCwindow(2,2,boxx,boxy,CHR$22
4)
390 box(boxx-4,boxy-7)=0
400 NEXT boxy:NEXT boxx
460 ENDPROC
980 REM*****
990 DEFPROCdelay(number)
1000 FOR delay=1 TO (number+1000)
1010 NEXT delay
1020 ENDPROC
```


whether any selected element already has a 1 in it, and if so, sends the program back until an array element is encountered with a 0.

```
470 REM*****
480 DEFPROCsmileys
490 FOR tally=1 TO 10
500 smileyx=RND(9):smiley=y=RND(9)
510 IF box(smileyx,smiley)=1 THEN
600 500
520 box(smileyx,smiley)=1
530 NEXT tally
540 ENDPROC
```

You can check whether your Smiley generator has worked by first of all removing line 55 and replacing it with "dummy" line 65.

65 600 65

Now type in line 525, which is a temporary line and will be removed later.

```
525 PROCwindow(2,1,smileyx+4,smiley
y+7,"*")
```

If you run the program you should find 10 red asterisks in the grid boxes showing the locations of the "hidden" Smileys. You can leave this line in for a while as it will be useful later for testing purposes.

OK, we've drawn the grid, initialised it, and hidden the Smileys. We are now ready for the input routine.

Remove line 65 and type in the next procedure.

```
550 REM*****
560 DEFPROCinput
570 PROCwindow(1,0,0,0,""):COLOUR12
9:CLS
580 PROCwindow(1,0,2,1,"Guess numbe
r:"):PRINTTAB(15,1);turns:PRINTCHR$(7
)
590 PROCdelay(1)
600 PROCwindow(1,3,2,3,"Input x,y -
")
610 REPEAT:guessx=GET-48:UNTIL guess
sx>=0 AND guessx<=9
620 PRINTTAB(14,3);guessx;" ";
630 REPEAT:guessy=GET-48:UNTIL guess
sy>=0 AND guessy<=9
640 PRINTTAB(16,3);guessy;
650 turns=turns+1
660 ENDPROC
```

This deals solely with your input to the computer.

It prints two lines of text using PROCwindow at lines 580 and 600, then uses the GET command to await your input. Lines 610 to 640 first of all validate your input, only accepting

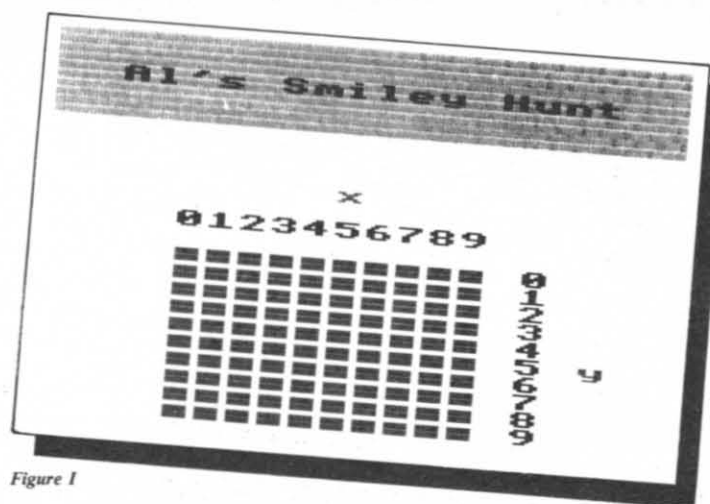


Figure 1

numbers between 0 and 9 and then having assigned the resultant number to variables *guessx* and *guessy* prints them out with a comma already between.

Line 650 simply adds 1 to the variable *turns* to keep tabs on how many attempts you've had. We'll use this later to print out a result.

Unfortunately you can't really check whether this routine is working correctly at this stage without a routine to process the information that you are inputting. Therefore, let's continue by typing in the next two procedures DEFPROCcheck and DEFPROCright.

```
670 REM*****
680 DEFPROCcheck
690 COLOUR120
700 IF box(guessx,guessy)=2 THEN PR
OCwindow(2,3,0,20,"You've had that on
e!"):PROCdelay(2);PRINTTAB(0,20);SPC(
20);ENDPROC
710 flagx=0:flagy=0
720 IF box(guessx,guessy)=1 THEN PR
OCright ELSE PROCwindow(2,0,guessx+4,
guessy+7,""):FOR snd=50 TO 0 STEP -5
:SOUND 1,1,snd,1:SOUND 0,-10,snd,1:NE
XT snd
730 FOR column=0 TO 9:IF box(column
,guessy)=1 THEN flagy=1
740 NEXT column
750 FOR row=0 TO 9:IF box(guessx,row
)=1 THEN flagx=1
760 NEXT row
770 IF flagx=1 AND flagy=0 THEN PRO
Cwindow(2,1,0,20,"Right column")
780 IF flagy=1 AND flagx=0 THEN PRO
Cwindow(2,1,0,20,"Right row")
790 IF flagy=1 AND flagx=1 THEN PRO
Cwindow(2,1,0,20,"Right column & row"
)
800 PROCdelay(3);PRINTTAB(0,20);SPC
(20)
810 ENDPROC
```

```
900 REM*****
910 DEFPROCright
920 PROCwindow(2,1,guessx+4,guessy+
7,CHR$(225)):FOR snd=0 TO 255 STEP2:S
OUND 1,-15,snd,0:NEXT:smileys=smileys
+1:box(guessx,guessy)=2:ENDPROC
```

The first DEFPROCcheck scans our input to see whether we have found a Smiley or not and line 720 does quite a lot here. It starts by checking to see if there is a 1 in the array element chosen.

If we have a bullseye, we go immediately to DEFPROCright at line 900 where a Smiley face, CHR\$(224) is printed at the location, and a suitably triumphant noise is generated.

Then *smileys* is incremented by one, and finally a 2 is placed in the array element to show that this particular location has been used. Line 700 checks for this number 2 and displays a message to that effect.

Should we fail to find a Smiley, a blank space is printed at the location and the line and column of that guess are checked to see if either contains a Smiley, in order to facilitate clues.

The clues are selected by setting *flagx* or *flagy* to 1 according to whether a column, or row, or both actually hold an undiscovered Smiley. These clues are intended to remove the guesswork, and from their content you should be able to plan your next choice.

We can now check that the game is running correctly so far. Enter line 105.

105 STOP

Now you can test out your input and detection routines by running the program again. Once the Smiley target figure in line 100 is reached, the program stops with a Break at line 105. When you are happy that everything is


```

10 REM Al's Smiley Hunt
20 MODE 5
30 PROCinit
40 PROCTitle
50 PROCgrid
60 PROCsmileys
70 REPEAT
80 PROCinput
90 PROCcheck
100 UNTIL smileys>9
110 PROCfinished
120 PROCresults
130 REM*****
140 DEFPROCinit
150 DIM box(9,9)
160 VDU23;820;0;0;0;
170 VDU23,224,0,126,126,126,126,126
,126,0
180 VDU23,225,126,255,153,255,189,1
95,255,126
185 ENVELOPE 1,1,50,-50,0,1,1,0,126
,0,0,-126,126,126
190 ENDPROC
200 REM*****
210 DEFPROCwindow(W,col,wx,wy,A$)
220 COLOUR col
230 IF W=1 THEN VDU28,0,4,19,0

```

```

240 IF W=2 THEN VDU28,0,31,19,5
250 PRINTTAB(wx,wy);A$
260 ENDPROC
270 REM*****
280 DEFPROCTitle
290 PROCwindow(1,0,0,0,""):COLOUR12
9:CLS
300 turns=1:smileys=0
310 PROCwindow(1,3,2,2,"Al's Smiley
Hunt")
320 PROCdelay(2)
330 ENDPROC
340 REM*****
350 DEFPROCgrid
360 PROCwindow(2,0,0,0,""):COLOUR12
8:CLS
370 FOR boxx=4 TO 13:FOR boxy=7 TO
16
380 PROCwindow(2,2,boxx,boxy,CHR$(22
4)
390 box(boxx-4,boxy-7)=0
400 NEXT boxy:NEXT boxx
410 FOR numx=4 TO 13:COLOUR 3:PRINT
TAB(numx,5);numx-4:NEXT numx
420 FOR numy=7 TO 16:PRINTTAB(15,num
y);numy-7:NEXT numy
430 PROCwindow(2,2,9,3,"x")

```

```

440 PROCwindow(2,2,17,12,"y")
450 PROCdelay(2)
460 ENDPROC
470 REM*****
480 DEFPROCsmileys
490 FOR tally=1 TO 10
500 smileyx=RND(9):smileyx=RND(9)
510 IF box(smileyx,smiley)=1 THEN
600 500
520 box(smileyx,smiley)=1
530 NEXT tally
540 ENDPROC
550 REM*****
560 DEFPROCinput
570 PROCwindow(1,0,0,0,""):COLOUR12
9:CLS
580 PROCwindow(1,0,2,1,"Guess numbe
r:");PRINTTAB(15,1);turns:PRINTCHR$(7
)
590 PROCdelay(1)
600 PROCwindow(1,3,2,3,"Input x,y -
")
610 REPEAT:guessx=GET-48:UNTIL gues
sx=0 AND guessx<=9
620 PRINTTAB(14,3);guessx;" ";
630 REPEAT:guessy=GET-48:UNTIL gues
sy=0 AND guessy<=9

```

Program II

From Page 65

working all right, remove line 105 and type in the next procedure DEFPROC-finished.

```

930 REM *****
940 DEFPROCfinished
950 PROCwindow(1,0,0,0,""):COLOUR12
9:CLS
960 PROCdelay(3):PROCwindow(1,2,2,2
,"That's the lot !"):PROCdelay(3)
970 ENDPROC

```

This detects the last Smiley and prints a message on the screen to that effect. The final procedure DEFPROC-results is entered via line 120.

```

820 REM *****
830 DEFPROCresults
840 PROCwindow(2,3,0,0,""):COLOUR12
8:CLS
850 PRINTTAB(0,9);"That took ";turn
s;" guesses"
860 PRINTTAB(0,12);"Try again Y/N ?
"
870 REPEAT:A=GET AND &F:UNTIL A=89
OR A=78
880 IF A=89 THEN CLS:PROCdelay(2):G
OTO 40 ELSE END
890 ENDPROC

```

This prints out the end result of your efforts. It simply takes the variable *turns*

***‘A negative response
throws you unceremoniously
out of the program’***

and prints it as part of a message. It then prompts to see if you wish to play another scintillating game. Once more it uses the GET command to await your key press. Note also how I've AND'ed the resultant key press with &DF to catch both upper and lower case entries of Y or N.

A positive response takes you back to line 40 carefully avoiding the arrays which must not be re-DIMmed, as mentioned last month.

A negative response throws you unceremoniously out of the program, and quite rightly, too. It's not every day you get the chance to play something as exciting and infinitely rewarding as Smiley Hunt. You know, I think I'll translate it for the Plectrum, it might make me a mint!

If having played the game a few times you are happy that it is working correctly, you can remove line 525. You'll find it's a different game altogether now!

It may not be the most sparkling program in the world, but it does contain some interesting techniques. For example, the input routines could be used in any program – they probably already have – and the checking routines could always prove useful. The important thing to me, though, is that you should have been able to follow it through line by line, procedure by procedure, and see how it was put together.

I'm going to stick my neck out now and say that it's absolutely bug-free, but I'm always prepared to be contradicted. After all, learning to de-bug programs is all part of the game, and I might have been crafty enough to have slipped one in for you to find . . .

Finally, we've made one or two alterations to the program as we've gone on. So just in case someone (including me) has left a line in that should have been removed, here is the final listing of my megagame.


```

640 PRINTTAB(16,3);guessy;
650 turns=turns+1
660 ENDPROC
670 REM*****
680 DEFPROCcheck
690 COLOUR12
700 IF box(guessx,guessy)=2 THEN PR
OCwindow(2,3,0,20,"You've had that on
e!");PROCdelay(2);PRINTTAB(0,20);SPC(
20);ENDPROC
710 flagx=0;flagy=0
720 IF box(guessx,guessy)=1 THEN PR
OCright ELSE PROCwindow(2,0,guessx+4,
guessy+7," ");FOR snd=50 TO 0 STEP -5
:SOUND 1,1,snd,1:SOUND 0,-10,snd,1:NE
XT snd
730 FOR column=0 TO 9:IF box(column
,guessy)=1 THEN flagy=1
740 NEXT column
750 FOR row=0 TO 9:IF box(guessx,row
)=1 THEN flagx=1
760 NEXT row
770 IF flagx=1 AND flagy=0 THEN PRO
Cwindow(2,1,0,20,"Right column")
780 IF flagy=1 AND flagx=0 THEN PRO
Cwindow(2,1,0,20,"Right row")
790 IF flagx=1 AND flagy=1 THEN PRO

```



```

Cwindow(2,1,0,20,"Right column & row"
)
800 PROCdelay(3);PRINTTAB(0,20);SPC
(20)
810 ENDPROC
820 REM *****
830 DEFPROCresults
840 PROCwindow(2,3,0,0,"");COLOUR12
8:CLS

```

```

850 PRINTTAB(0,9);"That took ";turn
s;" guesses"
860 PRINTTAB(0,12);"Try again Y/N ?
"
870 REPEAT:A=BET AND &F:UNTIL A=89
OR A=78
880 IF A=89 THEN CLS:PROCdelay(2);G
OTO 40 ELSE END
890 ENDPROC
900 REM*****
910 DEFPROCright
920 PROCwindow(2,1,guessx+4,guessy+
7,CHR$(225));FOR snd=0 TO 255 STEP2:S
OUND 1,-15,snd,0:NEXT:smileys=smileys
+1:box(guessx,guessy)=2:ENDPROC
930 REM *****
940 DEFPROCfinished
950 PROCwindow(1,0,0,0,"");COLOUR12
9:CLS
960 PROCdelay(3);PROCwindow(1,2,2,2
,"That's the lot !");PROCdelay(3)
970 ENDPROC
980 REM*****
990 DEFPROCdelay(number)
1000 FOR delay=1 TO (number*1000)
1010 NEXT delay
1020 ENDPROC

```

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FRON - Enable RAVEN-20 in FAST Mode
RVFF - Disable RAVEN-20
RTEST - TEST RAVEN-20 RAM
RSTAT - Show status of RAVEN-20
SSAVE - Save Screen to file
RAM - Sideways RAM load
RZAP - Examine/Alter BBC RAM
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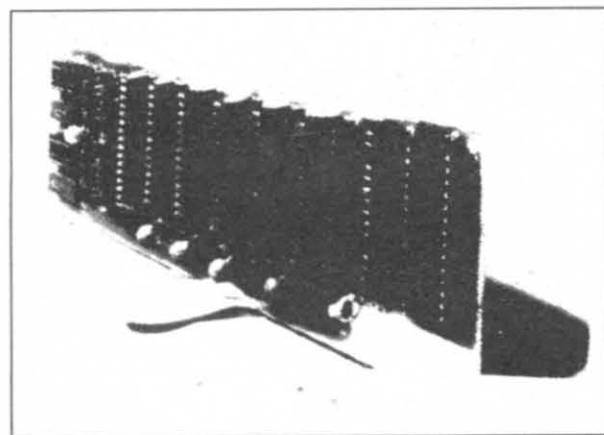
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What it offers the BBC Micro user...

Give your micro mainframe power

With MicroLink your micro becomes a terminal linked directly to the Telecom Gold mainframe computer, and able to tap its tremendous power and versatility. Right away you'll be able to use giant number-crunching programs that can only run on a mainframe. You can set up your own computerised filing systems, store and update statistics and other information, cross-reference material between files, selectively extract the information you want, perform massive calculations and design reports to display information from any of the files and in any format you choose.

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The number of bulletin boards is growing rapidly. New ones are springing up in all parts of Britain and all over the world, with people of like minds chatting to each other on all manner of subjects. The only snag is that the vast majority are single-user boards – which means lots of other people are also trying to make contact and all too often all you get is the engaged tone. But with the MicroLink bulletin board there is no limit to the number of people using it at the same time. And no limit to the number of categories that can be displayed on the board.

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The modern equivalent of the telegram is the telemessage. Send it before 10pm and delivery is guaranteed by first post the following day (except Sunday). The service was intended for people phoning their message to the operator, and it costs £3.50 for 50 words. But you can now use it via MicroLink for only £1.25 for up to 350 words!

Send and receive telex messages

With MicroLink you can turn your micro into a telex machine, and can send and receive telex messages of any length. You will be able to

communicate directly to 96,000 telex subscribers in the UK, 1½ million worldwide – and even with ships at sea via the telex satellite network. Business people can now send and receive telexes after office hours, from home or when travelling. You can key in a telex during the day and instruct MicroLink not to transmit it until after 8pm – and save 10 per cent off the cost!

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MicroLink is in operation 24 hours a day, every day. That means you can access your mailbox whenever you want, and from wherever you are ... home, office, airport – even a hotel bedroom or golf club! No-one needs to know where you are when you send your message.

What does it all cost?

Considering all the services you have on tap, MicroLink is remarkably inexpensive. You pay a once-only registration fee of £5, and then a standing charge of just £3 a month. On-line costs are 3.5p a minute (between 7pm and 8am) or 10.5p a minute during office hours. There is an additional 2p a minute PSS charge if you are calling from outside the 01-London call area. Charges for telex, tele-messages and storage of files are given on the next page.

How much it costs to use MicroLink

Initial registration fee: £5.

Standing charge: £3 per calendar month or part.

Connect charge: 3.5p per minute or part – cheap rate; 10.5p per minute or part – standard rate.

*Applicable for duration of connection to the Service.
Minimum charge: 1 minute.
Cheap rate is from 7pm to 8am, Monday to Friday, all day Saturday and Sunday and public holidays.
Standard rate is from 8am to 7pm, Monday to Friday, excluding public holidays.*

Filing charge: 20p per unit of 2,048 characters per month.

Applicable for storage of information, such as a telex, short codes and mail files. The number of units used is an average calculated by reference to a daily sample.

Information Databases: Various charges.

Any charges that may be applicable are shown to you before you obtain access to the database.

MicroLink PSS service: 2p per minute or part (300 baud); 2.5p per minute or part (1200/75 baud).

Only applies to users outside the 01-London call area.

Telex registration: £10.

Outgoing telex: 5.5p per 100 characters (UK); 11p per 100 (Europe); 16.5p per 100 (N. America); £1.15 per 400 (Rest of world); £2.75 per 400 (Ships at sea).

Deferred messages sent on the night service are subject to a 10 per cent discount.

Incoming telex: 50p for each correctly addressed telex delivered to your mailbox. Obtaining a mailbox reference from the sender incurs a further charge of 50p.

*It is not possible to deliver a telex without a mailbox reference. If a telex is received without a mailbox reference the sender will be advised of non-delivery and asked to provide a mailbox address.
Each user validated for telex and using the facility will incur a charge of 6 storage units a month. Further storage charges could be incurred depending on the amount of telex storage and the use made of short code and message file facilities.*

Telemessages: £1.25 for up to 350 words.

Radiopaging: No charge.

If you have a BT Radiopager you can be paged automatically whenever a message is waiting in your mailbox.

International Mail: For the first 2,048 characters – 20p to Germany and Denmark; 30p to USA, Australia, Canada, Singapore, Hong Kong and Israel. For additional 1,024 characters – 10p; 15p.

These charges relate to the transmission of information by the Dialcom service to other Dialcom services outside the UK and the Isle of Man. Multiple copies to addresses on the same system host incur only one transmission charge.

Billing and Payment: All charges quoted are exclusive of VAT. Currently all bills are rendered monthly.

Software over the telephone

MicroLink is setting up a central store of software programs which you'll be able to download directly into your micro. The range will include games, utilities, educational and business programs, and will cover all the most popular makes of micros.

Talk to the world – by satellite

MicroLink is part of the international Dialcom network. In the USA, Australia and a growing number of other countries there are many thousands of users with electronic mailboxes just like yours. You can contact them just as easily as you do users in Britain – the only difference is that the messages from your keyboard go speeding around the world via satellite.

What you need to access MicroLink

You must have three things in order to use MicroLink: a computer (it can be any make of micro, hand-held device or even an electronic typewriter provided it has communications facilities), a modem (it can be a simple Prestel type using 1200/75 baud, or a more sophisticated one operating at 300/300 or 1200/1200 baud), and appropriate communications software.

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- (✓) ☐ I also wish to use Telex. I authorise you to charge an additional £10 to my initial bill for validation.
- ☐ I confirm that I am over 18 years of age.

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Mailbox assigned _____

Start date _____

Password _____

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68 Chester Road
Hazel Grove
Stockport SK7 5NY.

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Position _____

Company _____

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Postcode _____ Daytime telephone _____

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Please indicate month of commencement _____ 19 ____

Allow 10 days for validation of mailbox

Payment

Whilst Database Publications Ltd is the supplier of all the services to you, the commission and billing thereof will be handled by Telecom Gold as agents for Database Publications Ltd. Date of first payment to be on 15th of month following commencement. Please complete billing authorisation form A, B or C below:

A. Direct Debiting Mandate (Enter full postal address of Bank Branch)

To _____

I/We authorise you until further notice in writing to charge to my/our account with you on or immediately after 15th day of each month unspecified amounts which may be debited thereto at the instance of British Telecommunications plc – TELECOM GOLD by Direct Debit. Bills are issued 10 days before debit is processed.

Name of Account to be debited _____

Account Number _____

B. Please debit my/our Access/Visa account number

I/We authorise you until further notice in writing to charge to my/our account with you on or immediately after 15th day of each month unspecified amounts which may be debited thereto at the instance of British Telecommunications plc – TELECOM GOLD. Bills are issued 10 days before charge is applied to your account.

C. Please invoice the company/authority.

- (✓) ☐ If you select this option, which is ONLY AVAILABLE to government establishments and public limited companies, you will be sent an authorisation form for completion which will require an official order number to accept unspecified amounts.

This Wizardore is simply wizard

EVERY now and then a game comes along that you know will be one of the all-time greats. **Wizardore**, from Imagine, is destined to be one of those games.

The object is to kill Smaun, an evil dragon who has enslaved the land, and to release the last of the Arch Mages.

To kill the dragon you will need to recover the three scattered pieces of the Golden Sword which are to be found somewhere within the depths of the dragon's castle.

To aid you in your quest you will find three scrolls which enable you to cast spells to destroy some of the guards that patrol the castle.

Each scroll will only work on one particular type of guard – and although I'm not going to tell you which, I will say that the archers, the worst of the guards, are unaffected by any of the scrolls.

Since Imagine are offering a monthly prize for solving the game, I shan't give away any secrets. However, I will give you two tips to get you going.

There are two types of archers and the only way to avoid being



killed by them is to jump over their arrows.

During the course of the game you will see the occasional golem – a small figure – and if you pass over it you are given an extra life. Believe me, you'll need it.

To describe the game as a

ladders-and-levels type, though in a sense true, would be to give a false impression, as it is like no game I have seen before.

Essentially, it is an arcade adventure with the accent more on the arcade than the adventure.

The graphics are stunning, the scrolling excellent, and the keyboard response is immediate.

The Arch Mage that is controlled on screen is the best example of animation I have ever seen.

I must admit that I would have preferred to define my own key layout, as using the A key for "jumping" and for "up" often caused me to jump when I didn't want to – usually with fatal results.

Overall, a program that is hard to praise too highly. Phrases like "state of the art" come readily to mind and deservedly so. If a list of the top

BBC Micro games of all time is ever made, I am sure that **Wizardore** will be in the top three.

A fantastically addictive game that I highly recommend. Excellent.

Paul Gardener

It's better than Frak

DURING the mid-part of 1984, a game called **Frak** took the BBC Micro world by storm. Its strength was its unique cartoon-style graphics.

Icon Software has just released **Contraption**, which

ELECTRIFYING – THAT'S STATIX

WHEN **Statix**, from Psion, starts you find yourself on the boundary of an empty rectangle – empty, that is, except for the charge of static electricity after which the game is named.

Your aim is to capture chunks of the charge's territory, by drawing new boundaries, until you have control of at least 75 per cent of the rectangle.

Sounds easy? Believe me, it isn't. The charge may be static electricity, but it is pretty mobile, moving around its territory at random.

It can't catch you if you are on a firm boundary – either the original or one you have completed – but if you are in the midst of chopping off another piece of ground and it touches either you or any part of the new incomplete boundary, that's one of your five lives gone.

Also moving round the bound-

dary are "sparks" – only one at the start of each sheet, but more appear as time passes – and if one of these catches you, that's another life gone.

From time to time while you are busy drawing a new boundary, some rotten devil mistakes it for a fuse and lights it where you left the safe boundary.

If this burns down to reach you before you can get on to the boundary again, bang goes another life.

The aim is to pinch at least 75 per cent of the rectangle. You get 10 points for each 1 per cent if you draw the new boundary or any part of it at "standard" speed.

If your nerve is good and you hold down the slow move key while you draw it, you get 40 points for each 1 per cent.

Cut off a large lump as your last move and you get 100 points



bonus for each 1 per cent that you capture above the basic 75 per cent.

Complete one sheet and you start on the next, and everything

will be moving faster.

The game may appear simple, but I found it very addictive, partly because to achieve good scores requires skill and tactical judgment and not just quick reaction pressing large numbers of keys.

It can be played with a joystick, but I found it easier to use the keyboard.

The sound is effective, and you don't simply turn it on and off. You can vary it in incremental steps from barely audible to its maximum level, at which it still isn't loud enough to raise objections from others in the room.

All in all, an excellent game about which I have only two complaints. Firstly, there is no high score, and secondly, I have lost an awful lot of sleep playing it.

Michael Gilbert

From Page 73

employs the use of almost identical graphics – but these are combined with an even better game.

For those of you who were in Outer Mongolia at the time and missed out on Frak, I should explain that the characters in the game were very large, very detailed, and all outlined in black. This gave them a cartoon-style appearance.

In Contraption, the detail and the black outline have been retained but the characters are somewhat smaller.

This, plus the lack of a scrolling background, has eliminated the very noticeable slowing-up of the action which marred Frak.

To refer to Contraption as a ladders-and-levels game seems somewhat inadequate as it has been programmed so professionally.

The aim of the game is to manoeuvre the little man around the screen collecting apples.

Having collected his quota he can head for the exit door which is present on each screen.

Each of the screens consists of several platforms which are connected by lifts and dissolving floors. The latter can only support the character's weight



for a short time before he falls through to his death.

The controls for the game are simple – left, right, and jump. Planning a safe route around the screen, however, is not. A badly-planned route can mean an untimely death through contact with one of the many undesirables which patrol the scene.

Some of the methods required to traverse a seemingly impossible gap are ingenious.

Screen two is an ideal example. Having negotiated the lower half of the screen, you will notice that the apples are all situated on the very top level.

Jumping up to this level is quite impossible, so you must

investigate the devices which resemble valves from a trumpet moving up and down in sequence.

By walking to the base of one of these valves and then hitting the jump key several times in rapid succession, you will find that the man jumps up on to the top of the valve.

Once in this position you can sit back and relax as the valve tosses the man up into the air. With each bounce he flies higher until he lands on the upper level. Cunning, eh?

Personally I prefer Contraption to Frak. The graphics are just as good, but it has much more variety and some screens are just downright devious.

James Riddell

Amaze your friends...

FROM the first day that I got my BBC Micro, I have always thought that it was magic. But I never imagined that my silicon buddy would be applying to join

the Magic Circle.

With the help of **The Paul Daniels Magic Show** from Acornsoft, you can amaze your friends with stunning feats of magic, assuming that they stay awake long enough.

For one of the tricks, you will have to provide a pack of playing cards – otherwise everything you require is contained in the package. The cassette consists of a suite of ten short programs. Each one is either a complete trick, or is used as an aid in your performance.

It is advisable that you read the accompanying manual thoroughly before performing the tricks. It provides background information that is necessary for a successful performance and gives each of the tricks a star rating to indicate its difficulty.

Normally the one-star tricks are performed completely by the computer. One such trick is called Book.

The computer displays a series of random numbers in response to the user pressing the space bar. These numbers correspond to any page, line and word, contained in the BBC User Guide. Having got to this randomly-selected position, the computer will tell you the actual word that you have selected.

When I first ran the program I was impressed. How on earth could it memorise the entire user guide! What superior algorithm was involved? Calling the wife in from the kitchen, I proceeded to show her the trick.

Surprise, surprise, the electronic magician came up with the same page number, line number, and even the same word.

A quick look in the manual revealed a warning that the trick should not be repeated more than once in any one performance.

Some of the more complex tricks required the user to secretly indicate to the computer the details of the punter's card.

Very little effort has been put into the on-screen presentation of the tricks and I would be surprised if anyone could amuse themselves for more than half an hour with this package.

Magic on a computer just doesn't seem to work. In the words of Mr Daniels, you'll like this – but not a lot.

Jon Revis

Teach the kids a lesson

PARENTS – this is your chance. Are you fed up with being hammered by your kids at Donkey Kong and Elite? Do you want a chance to get your own back?

Well, now's your opportunity to teach them a lesson – in more ways than one.

Remember a card memory-game called Pairs, at which your parents always used to thrash you? Well, **Flip**, by Icon, is a reworking of this old game. And very well done it is, too.

The basic aim of the game is to guess a word of five letters which is chosen either by the computer or by your opponent.

This word is hidden behind a block of forty squares.

By moving an arrow around

the screen, you can select a square, which will reveal a little picture. You then select a second square, with the aim of revealing the matching picture.

If you get the right one, both squares go blank, revealing a part of the hidden word. If not, you try two more squares, until you succeed.

As you may have guessed, a good memory is no end of help.

This may not sound all that exciting, but believe me, **Flip** is fun, and where it scores is in presentation.

Each little picture is animated, and is accompanied by some relevant tune.

As there are 20 different pairs, it isn't easy to remember what was where, and it seems even

harder to guess your word when you can see only little bits of the letters.

If that isn't enough for you, you can have the computer set up anagrams of the words, and this makes for a real brain-stretcher.

Playing against the computer is fun, but the two-player version turns into a real needle match as you battle to guess your word before your opponent guesses his. In a nutshell, **Icon** has produced that rarity, an educational game that is fun.

With fascinating, excellent graphics and sound, the program is so addictive it will have the parents battling is out long after the kids have gone to bed.

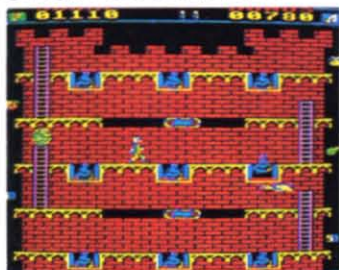
James Bibby

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Spelling can be noisy...

LASER Letters, from Shards Software, is crammed full of programs, with six separate spelling games, each of which can be used with its own word store of more than 500 words.

This allows the program to be utilised with a wide range of children, from six years of age upwards.

A menu is displayed which allows each game to be selected,

as well as for changes in the on-screen printing speed, difficulty level and so on.

Amazingly, there is no control whatever over the rather loud sound effects, which would soon prove to be annoying in a classroom.

Although the sounds are effective in one of the programs, in the others it tends to be more distracting than anything else.

Word Tangle and Letter Shuffle share the same purpose, that of testing alphabetical order.

In Letter Shuffle, this is tested on individual letters, while the other program extends the idea to words.

In neither case is there any attempt to correct or to teach, with the only screen responses being to award a score, or to ask for another try.

In fact, the computer will not give up, and stubbornly carries on asking for answers ad nauseam.

Whether a program like this has any advantage over a book or a blackboard is for the reader to decide.

Next Letter merely asks the child to enter the next letter in the alphabet after a given list, and seems to be of very little real purpose. Certainly the children I tried it with didn't want to know this part at all.

Back to Rack simulates a spelling competition in which the child tries to enter missing letters from a certain list in order to tip

a bucket of evil-looking gunge on to the opposing figure before it ends up all over the picture of the child.

There are various combinations of letters which can be selected, but I am still not entirely convinced of the real value of a program of this kind.

By far the best idea on the tape is an original-looking idea called Bridge of Words.

A simple clapper-type bridge is made of three words, one each for the supports and one for the centre span. Certain letters are missing from each word, and these are gathered together near the top of the screen.

An asterisk is moving continuously across the bridge, and can be replaced by a letter by pressing the appropriate key.

When the letter is in the correct position, it is released by pressing the Spacebar, and in this way the bridge can be completed.

This game has much potential, and as a teacher, I would have liked to see a chance to enter my own choice of words to suit my own children.

As it stands, this program alone is almost good enough to make it worth buying the cassette.

The last program on the tape, **Laser Letters** itself, continues the theme of missing letters, but with the child having to fire the right letter exactly into place as it moves erratically up and down

the screen.

The scrolling effect makes it quite exciting for a child to play, and, with **Bridge of Words**, tips the balance in favour of this tape.

However, I see its use much more at home than in schools.

Phil Tayler

You need to be speedy

THE quest begins in the darkest depths of the Labyrinth. Freedom is to be found high upon the seventh level, but reaching it will not be easy. Speed, ingenuity and a good memory will all be necessary if you are to reach your goal...

In **Labyrinth**, from Acornsoft, you control the hero, Mork, on his journey through the maze. To progress to the next level you must locate the magic crystal that is hidden in one of the chambers. Having acquired this, you can use it to break down the force field that bars the exit.

In case you were thinking of casually strolling around the Labyrinth until you found the crystal, forget it. The maze is inhabited by combinations of up to nine different creatures, all of

These stars don't sparkle

ON reading the cassette insert for **3-D Space Ranger**, an arcade game from Microbyte, one gets a feeling of *déjà vu*. The Cyborg Empire has invaded the Federation and its Death Stars are advancing towards planet Earth.

They have one weakness—the thermal exhaust port leading to the main reactor. Your mission is to penetrate their defences and release a photon charge into this exhaust port.

Sounds rather like the climax of a certain well-known film, doesn't it? Unfortunately, the game doesn't measure up to the excitement of *Star Wars*.

While the tape is loading, everything seems quite promising. You are offered a choice of joystick or keyboard controls and the computer then tells you which key controls which func-



tion. If this doesn't meet with your approval, you can program in your own choice, after which you are given detailed instructions for the game.

In a nutshell, you have to pilot your ship through space, avoiding alien craft and asteroids, skim over the surface of the Death Star, pursued by more aliens, fly down a trench, release your photon charge at the correct point, and then run for home.

To help you, you have lasers, three of the ubiquitous Smart Bombs, and energy shields. All of these drain energy from your Space Ranger and if you use too much, you won't make it back to base.

This all sounds very promising, but I'm afraid I found the game rather dull.

Firstly, your on-screen craft is rather large, and gives the game a constrained feeling.

Secondly, the asteroids and alien ships move with the agility

of a tortoise that has seen better days and are rather easy to avoid or destroy.

Thirdly, you don't have to fire the photon charge yourself. As long as you have followed your onboard computer's instructions, it is released automatically at the right moment.

All this makes the game rather easy. At only my second attempt I completed the mission, and I'm no Han Solo.

If you like sitting in front of a game for hours piling up an enormous score, this may be your cup of tea. If you don't, then you may get bored rather quickly. And if you've played *Elite*, then I'm afraid **3-D Space Ranger** is going to end up on a shelf, gathering large amounts of dust.

James Bibby

which have no intention of letting you leave.

Mork is armed with a gun which is effective against the majority of nasties. However, some monsters required a slightly larger dose of lead than others before they decided to fall over.

Mork is also provided with a large boulder which can apparently be used to flatten some of the more stubborn monsters. I found that pushing it around tended to cramp my style, so I stuck with the rapid-fire technique.

Monster-bashing is pretty exhausting work, so to ensure that our hero doesn't over-exert himself an energy indicator is displayed, the length of a green bar representing the amount of energy left. By eating the fruit that is scattered about the labyrinth you can maintain your energy levels.

While travelling around the maze, your way may be barred in either of two ways: a force field blocking the way to the next level, and two impenetrable flashing cubes situated in the doorway to a new chamber. These cannot be shot, bouldered or walked through, but with a little cunning you should figure out how it's done.

Labyrinth can be played at quite a steady pace on the lower levels. Your energy reserves are depleted at a miserly rate and you can always turn and run from the monsters should things become a little too hairy.

I don't think that Labyrinth will ever be ranked as a classic, but it is certainly worth taking a look at should you get the chance.

Jon Revis

Keep tabs on your money

WHEN home micros were invented, a frequent question was "... but what use are they?" to which a frequent answer was "to keep track of household accounts".

It is a personal view, but it seems to me that home accounts programs are of limited value

unless they are sufficiently simple and easy for users to actually bother to keep data complete and accurate.

Also, the program should tell the user something worthwhile which is not easily obtained from another source — such as from a bank statement.

I think Squirrel Software's **Moneywise** qualifies under both these criteria. It will work using either cassette or discs.

The program deals with only two accounts at once, probably following the user's main bank account and something like cash or credit cards transactions. It would be possible to use more than one data file to allow additional pairs of accounts to be handled.

For each account the program presents a column of 40 expenditure categories and 12 income categories. The user labels these as appropriate — rates, electricity, salary and so on. The same labels will apply automatically to every month and both accounts.

The account and month being dealt with are chosen and the user proceeds to enter the amounts for each category.

Some preliminary work might be needed here such as going through cheque book stubs and adding up all the amounts spent in each category.

It is easy to edit previous data entries and running totals could be kept on the screen. However, the user would have to enter the new total rather than the new amount as the program does not allow amounts to be added to a category. I think this is something that could be improved.

A category's data can be copied from the previous month — useful for standing orders — and it is possible to re-analyse amounts over other categories.

A summary sheet can be obtained — of both accounts in total — showing the total of each category for the year.

From this sheet bar charts can be produced showing, for one category at a time, expenditure against time.

Any page of the accounts can be printed and the screen memory of bar charts can be saved for later printing using a suitable screen dump program, not supplied as part of **Moneywise** and not tested by me.

In conclusion, a useful easy-to-work home accounts program.

Ken Garrett



Gold in them there tunnels

ALTHOUGH the bottom may have dropped out of the gold market in the financial world, in **Gold Digger**, from Firebird, it is still a much-sought-after commodity.

Your aim in this nice little arcade game is to tunnel about underground, collecting the various nuggets that lie in your path.

You have only a limited time to collect them all, but even so it seems easy enough, doesn't it?

However, your task is made decidedly tricky by a group of "misers" who are out to stop you. They follow you around with the unerring homing instinct of a Scotsman after a bargain, and a nasty collection they are.

The first one has an annoyed expression and several legs and looks like a red spider with a hangover. The others resemble a smiling green pumpkin, a yellow frog in goggles and a dozy purple robot.

All the misers are determined to prevent you digging up the gold and all have their own method of chasing you. If they catch you it's curtains, so you either avoid them, or tunnel under a rock and hope it squashes them.

Should you succeed in collecting all the gold, you find the next screen is more difficult, as the number of misers increases

until eventually it is almost impossible to stay alive.

On the whole, this is a good game, with reasonable use of colour and sound. In fact, I found the sound rather overpowering at one stage.

While loading, the computer goes into a strident version of "Clementine" — the sort of version Reginald Dixon might have produced given a fair-ground organ and half-an-hour of glue-sniffing. However, this can be switched off.

My only complaint is one that can be levelled at several games. There is a pause button that freeze-frames the game, which is useful when in a very tight corner. Unfortunately, it is the R key, well away from the other controls and difficult to hit in an emergency.

However, I've temporarily solved the problem. I can catch the R key every time with my forehead. The only trouble is, my micro is beginning to look rather battered and I seem to be getting an awful lot of headaches lately.

James Bibby

You'll fall for Mineshaft

DEEP down in the mine, you must struggle against time and numerous obstacles in an attempt to collect chunks of coal before your air supply is exhausted.

Having cleared one cavern of its hoard of black gold, you are transported to the next, more testing, level...

Mineshaft, from Durell Software, is another offering in the Manic Miner/Blogger style for the BBC Micro and Electron.

Each screen contains several chunks of coal, the majority of these being in the most inaccessible of places. The screen also contains numerous ledges. Most of these are solid, but there are some which are constructed of slurry.

The slurry ledges are only designed as temporary resting-places. Stand around for too

SOFTWARE SCENE

From Page 77

long and you will fall through the ledge and plummet to your death.

Each of the screens has an exit door, but this will only open once every piece of coal has been collected.

As is the norm with this type of game, it will soon become apparent that there is only one correct path through the screen.

Not only must your route be correct, but you must also time it perfectly as many of the solid platforms are patrolled by runaway coal trucks, ghosties, and even mutant matches.

The game runs using Mode 1 graphics. Durell have made use of the resolution available to create very clever screens.

Many other games can also boast this number of screens, but the majority of players will never see more than the first five. Durell have negotiated this problem by allowing the player to progress to the next level at any time during the game by

pressing Escape. This facility ensures that your interest in the game will remain alive longer than usual.

If you are stuck on one particular screen, give it a rest and play the next one. It may provide some inspiration.

Mineshaft is a fine example of the Manic Miner class of game. All of its screens are clever, some are practically impossible, but you always feel that you will make it in the end.

Carole Barrow

Filing made easy

MICRO-PHILE, from Ephagy Software, is an inexpensive and easy-to-use electronic filing system.

It will cope smoothly with basic record addition, modification, and deletion, and brow-

sing. Sorting can be carried out on one of two key fields defined at set-up.

Record retrieval, based on the current key, allows a degree of fuzzy search by defaulting to the nearest likeness when there is no exact match.

Its greatest asset, however, is the selection option. This allows up to 10 combinations of search criteria.

This includes numerical operators, using English rather than symbols – greater than, less than and so on – the logical operators AND and OR, and the more unusual contains/does not contain, begins/finishes with, and precedes/succeeds.

Averages, totals, and even standard deviation can be requested for inclusion in the output, and the results of the search may be sent to the screen or to a printer.

Unfortunately the format of the output cannot be customised, and this area of the program constitutes its crudest

aspect – although a close second is the screen presentation, which, if you like being dazzled by the colours of the rainbow, should suit you nicely.

You can modify a file structure with the Transfer option, which allows all or parts of your data to be saved for use by a different data file.

The documentation, although somewhat higgledy-piggledy, includes usable reference and error message sections, an index, and a quite respectable tutorial.

So for straightforward filing and output, Micro-Phile, with its standard report generator, its fairly flexible query facility, and some simple stats options, should be more than adequate.

If your application is something more sophisticated, I would say that, despite its name, neither you nor your BBC Micro is likely to fall in love with it.

But at £14.95 it certainly represents good value for money.

Katherine Cranford

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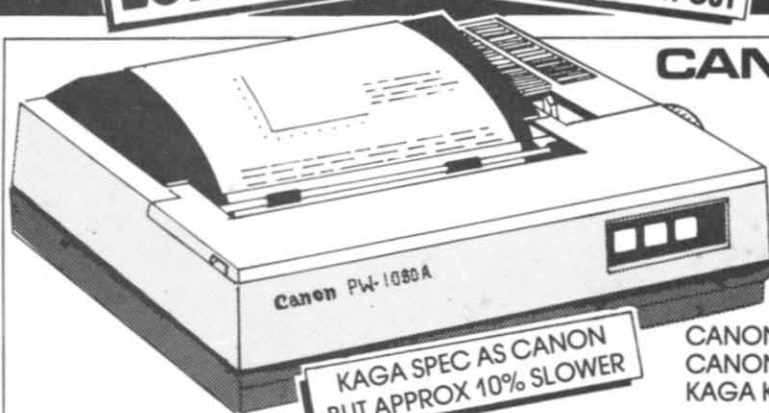
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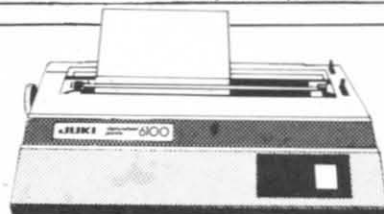
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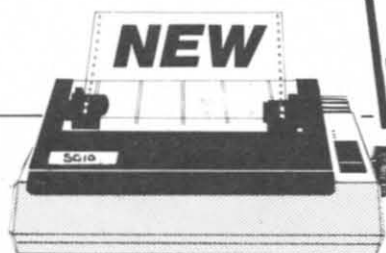
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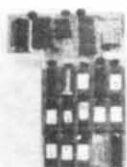
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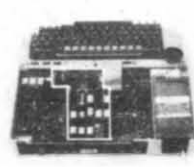


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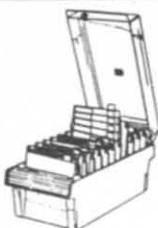
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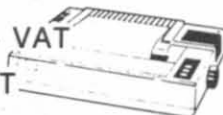
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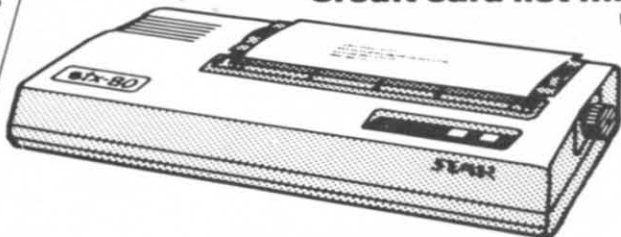
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THERE's been such a tremendous response to my machine code games series that the editor's decided that this month I've to give you a complete game combining several routines from the series. This, I hope, will help you understand how a machine code game should be written.

The game uses two sprites, a character we'll refer to as a ball, and an arrow. Your aim is to fire the arrow at the right moment so that it collides with the moving ball — it couldn't be simpler.

The ball drops down the screen from a random column position at different speeds. The arrow is controlled by you and can only be fired across the screen from left to right — by pressing the Spacebar. It's not exactly Elite, but at least I can explain how it works. The program uses two main subroutines which are both related to sprites.

The first routine *sprite* is responsible for displaying and erasing sprites — see Page 92 of the June, 1985, issue of *The Micro User* for a thorough description.

The other routine *calc_loc* calculates the screen location for a screen X and Y coordinate — the origin of which is the bottom left corner. This was first used on Page 93 of the May, 1985, issue of *The Micro User*.

There are several other subroutines which are responsible for simple tasks such as setting up information for the sprite routines and generating random numbers.

The object code created by the program is assembled at location &2E00 and occupies around 400 bytes of memory. The game can be executed, once assembled, by entering:

CALL start

An arrow will appear at the bottom left of the screen. You must now wait for the ball — a large circle with legs and an

ugly face — to appear in the top half of the screen. And at the right moment you should fire the arrow, by pressing Space, so as to cause a collision.

Here's an outline of the steps we follow to achieve this:

1. Initialise various variables and reset the sprites.
2. Wait for a random length of time and then put the ball on the screen.
3. Move the ball a small distance down the screen.
4. If the arrow is in motion move it right by one place. Otherwise, check if the spacebar is pressed. If it is, move the

MACHINE CODE GAMES

By KEVIN
EDWARDS

Now let's put it all together

arrow.

5. Check if the two sprites have collided. If they have, make a beep and jump to step 1.

6. Check if either sprite has reached the edge of the screen. If this is the case jump to step 1, otherwise, jump to step 3.

As you can see, it's quite simple. Let's take a look at how the program achieves this.

All this may seem a long-winded way to perform such a simple task, but you'll



10-120	Initialise various variables and select the assembler options.	540-550	Calculate a random X coordinate between 30 and 60 — in steps of 2 — for the ball. Giving the ball a random start address makes it more difficult to play the game.
130-310	The sprite routine. This is responsible for displaying/erasing sprite characters on/from the screen.	560	Resets the ball's Y coordinate to 200 — in the top half of the screen.
320-400	Calculate the screen location for a given X, Y screen coordinate. The origin is taken to be at the bottom left of the screen.	570	Displays the ball on the screen.
420	Resets the arrow's status. If the location <i>moveflag</i> contains zero the arrow is stationary, otherwise, the arrow is moving.	590	Checks if the arrow is moving. If it is then branch. This is done to avoid the key check routine which isn't needed because the arrow is already moving.
430-440	Randomly select either 2 or 3 and store it in location <i>speed</i> . This indicates the number of pixels by which the ball will move down the screen. A large value would make the ball move faster than a smaller one.	600	Tests to see if the Spacebar is pressed. Branch if false.
450-460	Initialise the arrow's screen coordinates to the bottom left of the screen.	610	Stores &FF in the arrow movement flag. This indicates that the arrow is now in motion.
470	Displays the arrow on the screen.	620	Erases the arrow from the screen.
480	Places a random nybble, a four bit number between 0 and 15, into the X register.	630	Increments the arrow's X coordinate to move it right one place.
490-530	Wait for a random length of time. The length is determined by the random number returned from line 480. The delay is achieved by having three nested loops. This can take a long time to execute even in machine code. The random number previously created is used for the outer loop.	640	Checks if the arrow has reached the right-hand edge of the screen and branches if false.
		650	Removes the ball from the screen then jumps back to the start of the main loop.
		660-670	Test for a collision between the two sprites. This is done by peeking the screen memory




```

10 REM Simple demo game
20 REM By Kevin Edwards
30 MODE 2
40 swidth=74
50 sheight=75:sheight2=78
60 coltoplow=76:screenlow=70
70 coltophigh=77:screenhigh=71
80 temp0=80:temp1=81
90 temp2=82
100 HIMEM=42E00
110 FORpass=0TO2STEP2:PX=HIMEM
120 OPTpass
130 .sprite STXswidth
140 STYsheight:STYsheight2
150 .user_entry LDY00
160 .main_part LDAcoltoplow:AND0F8
:STAScreenlow
170 LDAcoltophigh:STAScreenhigh
180 LDAcoltoplow:AND07:TAY
190 .column LDAFFFF,X:EOR(screenlo
w),Y
200 .onto_screen STA(screenlow),Y
210 INX:BEQ inc_data_high
220 .end_checks INY:CPXsheight2:BEQ
end_of_column
230 CPY00:BNEcolumn
240 LDAscreenlow:ADC07F:STAScreenl
ow
250 LDAscreenhigh:ADC02:STAScreenhi
gh
260 LDY00:BEQ column
270 .inc_data_high INCcolumn+2:JMPe
nd_checks
280 .end_of_column CLC:LDAcoltoplow
:ADC08:STAColtoplow:BCCno_high:INCcol
tophigh
290 .no_high CLC:LDAsheight2:ADCshe
ight:STASheight2
300 DECswidth:BNEmain_part
310 RTS
320 .calc_loc LDA030:STAtemp1
330 LDA00:STAtemp2
340 TYA:EOR0FF:TAY:AND07:STAtemp0
350 TYA:LSRA:LSRA:LSRA:ASLA:TAY
360 TXA:ASLA:ROLtemp2:ASLA:ROLtemp2
370 ASLA:ROLtemp2
380 ADCtemp0:ADC0376,Y:STAColtoplo
w
390 LDAtemp2:ADCtemp1:ADC0375,Y:ST
AColtophigh
400 RTS
410 .start
420 LDA00:STAMoveflag
430 JSRrandombyte:AND01
440 CLC:ADC02:STASpeed
450 LDA00:STAarrowX
460 LDA030:STAarrowY
470 JSRarrowonscreen
480 JSRrandnyb
490 LDY00
500 .delay1
510 DECTemp0:BNEdelay1
520 DEY:BNEdelay1
530 DEX:BPLdelay1
540 JSRrandombyte:AND0F:ASLA
550 CLC:ADC030:STABallY
560 LDA0200:STABallY
570 JSRballonscreen
580 .repeat1
590 BITmoveflag:BNImoveacross
600 LDY09D:JSRinkey:BNEnotspace
610 LDA0FF:STAMoveflag
620 .moveacross JSRarrowonscreen
630 INCarrowX
640 LDAarrowX:CMP070:BNEreplacearro
w
650 .eraseball JSRballonscreen:JMPs
tart
660 .replacearrow LDYarrowX:LDYarro
wY:JSRcalc_loc
670 LDY040:LDAColtoplow,Y:BEQnoh
it
680 LDA07:JSR0FFEE
690 JSRballonscreen:JMPstart
700 .nohit JSRarrowonscreen
710 .notspace LDA019:JSR0FF4
720 JSRballonscreen
730 LDABallY:SEC:SBCspeed:STABallY
740 CMP010:BCSreplaceball
750 JSRarrowonscreen:JMPstart

```

From Page 83

find this is the case for most machine code games.

When writing your own games you should break the program into simple steps – as I've done at the start of the article. This will make the programming

easier and allow you to identify sections of repeated code which can be put into a subroutine – thus saving you memory.

I hope this has given you some more ideas for writing your own games. For starters, try modifying the one described here. For instance, you might have two arrows, one low, the other high. Or more

than one ball could be dropping at the same time. Or the ball could zig-zag on its way down. And you might like to give it some sound effects. Try it – you'll learn a lot by tinkering!

And if you come up with anything interesting, send it in and let us have a look.

- &40 bytes ahead of the arrow's top left screen location. If the screen byte returned is zero, indicating no collision, the branch is taken, otherwise, a collision has occurred.
- 680 Makes a beep – VDU 7 – indicating a collision.
- 690 Erases the ball from the screen and starts the program again.
- 700 Puts the arrow on the screen in its new position.
- 710 Waits for next screen re-fresh – OSBYTE 19. This gives smooth movement and reduces flicker.
- 720 Deletes the ball from the screen.
- 730 Decreases the ball's Y coordinate to move it down the screen. The number subtracted depends on the contents of the location given by the variable *speed*. This will be either 2 or 3 depending on the number stored there at the start of the main loop – see line 440.
- 740 Checks if the new Y coordinate is greater or equal to 10. If this is true the branch is taken because the ball has not gone off the bottom of the screen.

- 750 Deletes the arrow from the screen then jumps back to the start of the program.
- 760-770 Display the ball in its new position then jump to start of main loop.
- 780-820 Display/erase the arrow on/from the screen. Before the sprite routine can be called various information must be set up. This includes the graphic data pointer – 790-800 – the screen address – 810 – and the sprite's dimensions – 820.
- 830-870 Display/erase the ball on/from the screen. See the previous description for additional information.
- 880-890 Check if a certain key is pressed. On entry the X register should contain the negative inkey number of the key to be tested. On exit the Z flag will be 1 if the key is pressed and 0 if it's not.
- 900 Generates a random nybble in the X register.
- 910 Generates a random byte in the Accumulator.
- 920-970 Reserve room for various variables used by the routine.
- 990-1010 Read the sprite graphic data into page &C.
- 1030-1110 The arrow graphic data.
- 1120-1360 The ball graphic data.

```
AX:RTS
910 .randombyte SEI:LD&FE60:EOR&FE
44:EOR&FC:CLI:RTS
920 .arrowX NOP
930 .arrowY NOP
940 .ballX NOP
950 .ballY NOP
960 .moveflag NOP
970 .speed NOP
980 JNEXT
990 FOR LX=0 TO &FF
1000 READ LX:&C00
1010 NEXT
1020 END
1030 REM Arrow data
```

1240 DATA &3C, &3C, &3C, &3C, &3C, &3C, &3C, &3C
&3C
1250 DATA &3C, &3C, &3C, &3C, &3C, &3C, &3C, &3C
&3C
1260 DATA &3C, &3C, &3C, &3C, &3C, &3C, &3C, &30
&30
1270 DATA &3C, &3C, &3C, &3C, &3C, &3C, &3C, &3C
&3C
1280 DATA &3C, &3C, &3C, &3C, &3C, 3, 3, 3, &29
1290 DATA &3C, &3C, &30, &30, &30, &30, &30, &30
&34
1300 DATA &3C, &3C, &39, &39, &3C, &3C, &3C, &3C
&28
1310 DATA &28, &3C, &3C, &3C, &16, &16, &16, &16
&3C
1320 DATA &3C, &3C, &3C, &3C, &3C, &3C, &3C, &3C
&3C
1330 DATA &3C, &3C, &33, &33, &39, &39, &33, &33
&33
1340 DATA 0, &28, &28, &28, &28, &28, &3C, &3C
&3C
1350 DATA &3C, &3C, &3C, &3C, &3C, &3C, &3C, &3C
&3C
1360 DATA &3C, &3C, &28, &28, &28, &22, &33, &33
&33

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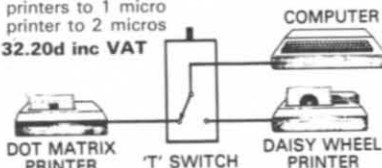
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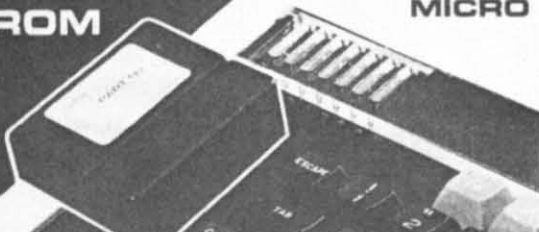
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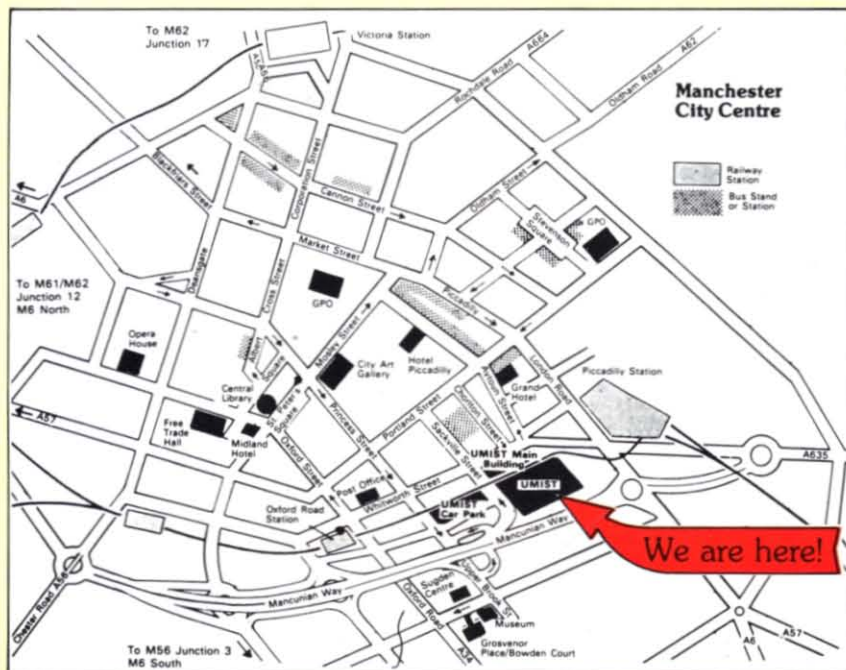
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MU9

JIM NOTMAN
gives his
comprehensive
appraisal of the
latest version of
the BBC Micro

Revealing t of the

THE carton it comes in may have a sticker declaring "64k RAM", but from the outside the BBC B+ looks exactly like an ordinary BBC Micro with all the usual sockets where you'd expect to find them.

There are no fancy stripes or even a label saying it is a B+. A bit of a disappointment for show-offs. However when the lid is taken off there is no doubt something is different.

The circuit board has been redesigned with a number of the components being moved from their familiar positions on earlier boards. All the chips are now soldered in place instead of some being mounted in sockets. This may make manufacturing easier, but often makes servicing more awkward.

The 6502 microprocessor has been replaced by a 6512. In most respects it is exactly the same as the 6502, but there should be fewer problems with bus timing.

The RAM chips have also changed. Instead of 16 2k chips there are now eight 8k chips, arranged in two 32k banks, one covering the addresses from 0 to &7FFF, the other &3000 to &AFFF.

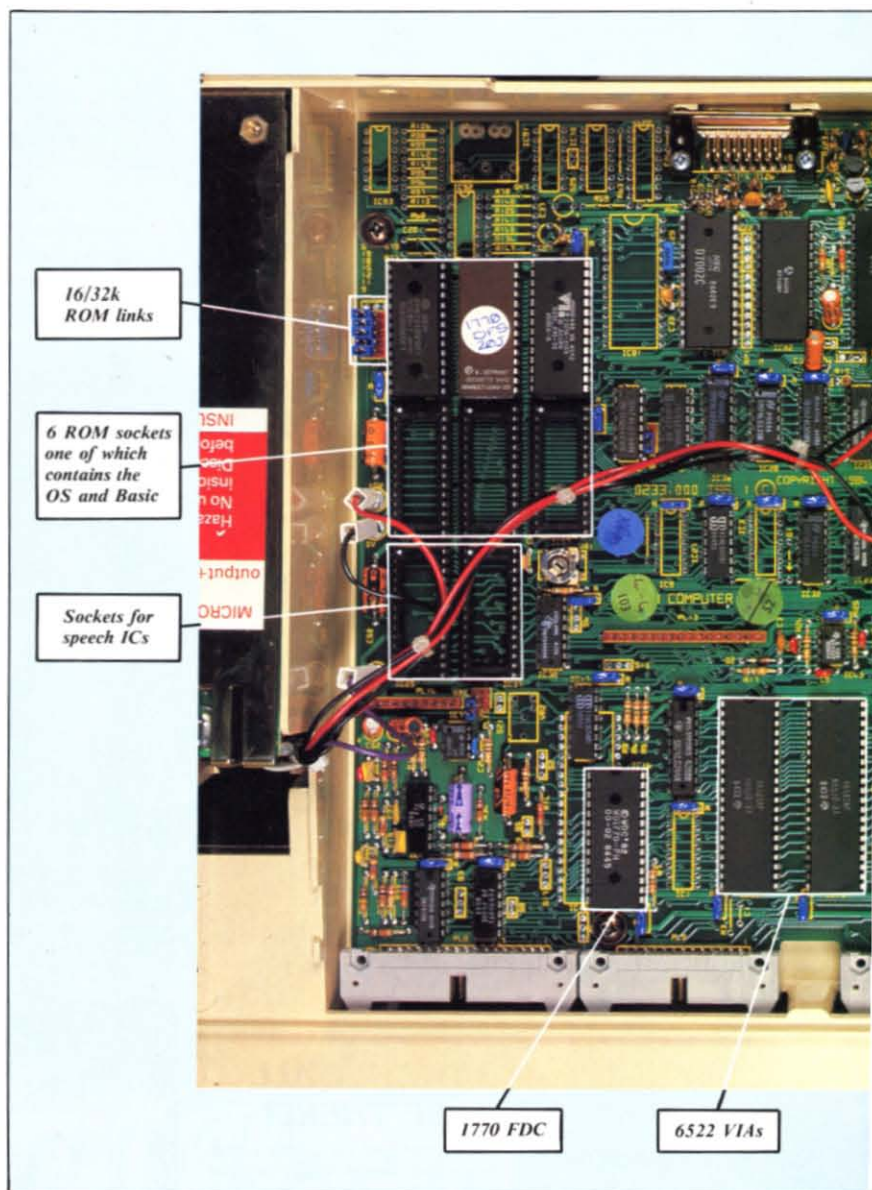
This provides the B+ with its most distinctive feature. The second bank of RAM releases memory in the main memory area for program use, while this "shadow" RAM is used for screen memory. At last you can run large programs in Mode 0.

As at most the screen only occupies the shadow RAM from &3000 to &7FFF, the remainder of the RAM from &8000 to &AFFF is available for other uses.

All the expected interfaces are present, such as cassette, RS 423 and various video outputs, as well as space for fitting the Econet and speech interfaces.

The disc interface is now standard, but this now uses the Western Digital 1770 floppy disc controller in place of the expensive, hard-to-get, single density Intel 8271.

The circuit board reveals that even at a late stage of planning Acorn was still not sure which disc controller to use,



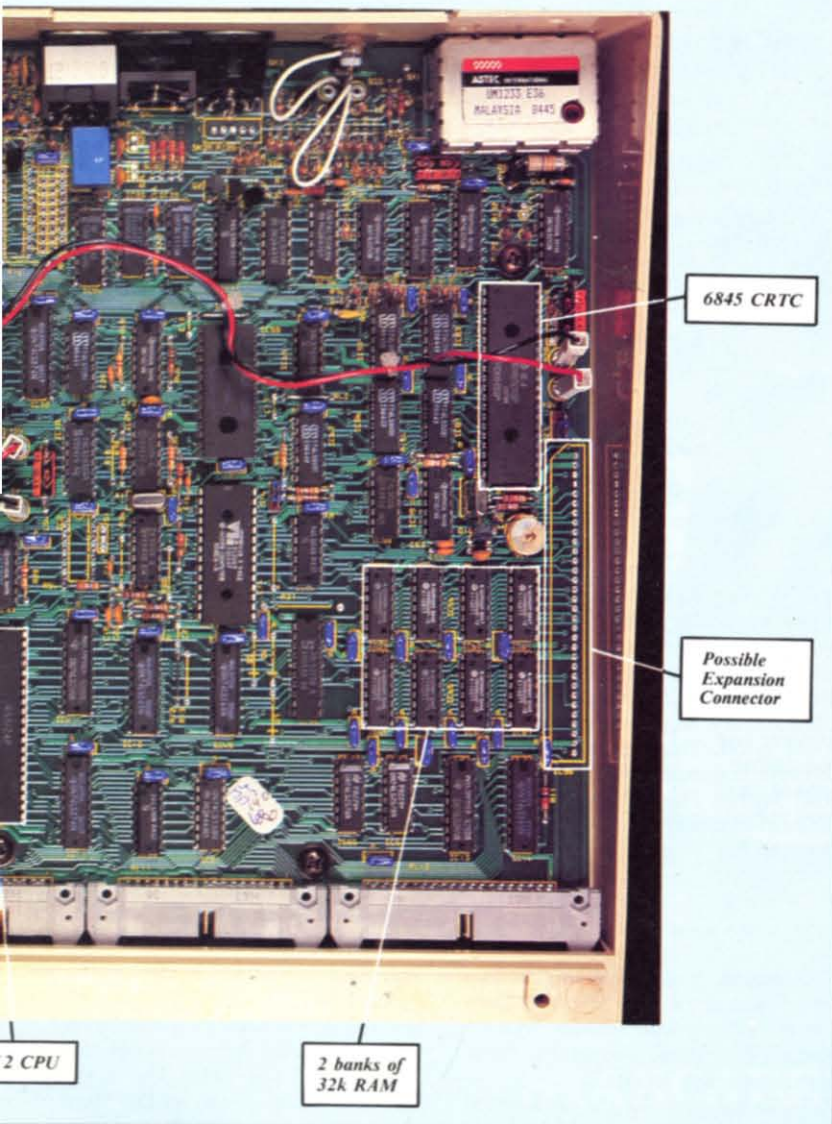
with a position for a 40 pin chip being provided, partly under the 1770.

Instead of the four paged ROM sockets, there are now six sockets, including one which takes the combined Basic and operating system chip. Each socket is designed to take either a 16k

ROM or a 32k ROM which is treated as two 16k ROMs. For instance, Pascal and Logo are on two 16k ROMs which can presumably be put on to a 32k ROM and so occupy only one socket.

A row of five links, to the left of the sockets, switch between the option of a

he potential B+...



32k or a 16k chip.

Basic is placed in socket 15. A link – S13 – to the right of IC46 is provided to alter the socket address to 1. This is necessary if another language ROM is to have priority over Basic. The change in position, number and link options

means that current sideways ROM boards will have to be redesigned.

The Tube is now fully buffered – combined with the switch to a 6512 processor, timing problems should be a thing of the past. The 1MHz bus is also buffered now – and the famous glitches

are said to have been eliminated.

Switch-on revealed one disappointment. I would have thought that with the board being redesigned they could have done something about the annoying buzz from the loudspeaker. This seems to be more obtrusive than in earlier machines.

A question often asked at the moment is: "Will it be possible to update a standard model to the B+?"

Acorn says it will not be providing conversion kits, but will depend on the independent suppliers to provide the need.

Shadow screen is already available by companies such as Aries and Watford. They have some disadvantages by not providing any paged RAM – between &8000 and &AFFF.

The software to drive them is a patch additional to the operating system which requires extra workspace, rather than being part of the MOS as in the B+.

A number of disc interface kits featuring the 1770 are now on the market as dual single/double density versions of the DFS. These will not work directly with the Acorn 1770 DFS as the hardware addresses are often different.

The B+ gives a new startup message:

```
Acorn OS 64k
Acorn 1770 DFS
Basic
```

A *HELP responds with:

```
DFS 2.0j
DFS
UTILS
OS 2.00
```

With different versions of the BBC Micro around, the software needs to be able to sense which machine it is in. Two calls are provided. OSBYTE 129 can tell which type of machine you are in, and OSBYTE 0 can give you the OS version.

Program I (overleaf), which documents the action addresses of the OS, gives an example of how this can be done – lines 50 and 60.


```

10 REM OS action addresses
20 REM (C) The Micro User
30 ON ERROR GOTO200
40 @X=&404
50 A%=&X=255
60 version=((USR&FFF4)&AND&FFFF)DIV
256
70 version$=""
80 IFversion=0THENversion$="1.00"
90 IFversion=1THENversion$="1.20"
100 IFversion=2THENversion$="2.00"
110 IFversion$=""THENPRINTCHR$(7)""
Unrecognised OS":END
120 REPEAT
130 CLS
140 PRINTTAB(5,2)"BBC Operating Sys
tem Action Address Documenter"
150 PRINTTAB(10,5)"1..Command Table
"
160 PRINTTAB(10,7)"2..VDU action ad
dresses"
170 PRINTTAB(10,9)"3..OSBYTE action
addresses"
180 PRINTTAB(10,11)"4..OSWORD actio
n addresses"
190 PRINTTAB(10,13)"5..End"
200 REPEAT:optX=GET-48:UNTILoptX=1
ANDoptX<=5
210 IFoptX<5THEN PROCprint
220 ONoptXGOSUB240,250,260,270,300
230 UNTILFALSE
240 PROCoscmd:RETURN
250 PROCvdu:RETURN
260 PROCosbyte:RETURN
270 PROCosword:RETURN
280 VDU3:@X=&90A:IFERR<>0THENREPORT
:END
300 @X=&90A:CLS:END
310 DEFPROCoscmd
320 IFversion=0THENaddress=&DF04:fi
nish=&DF79
330 IFversion=1THENaddress=&DF10:fi
nish=&DFB4
340 IFversion=2THENaddress=&DFFC:fi
nish=&E075
350 PRINT"Operating System version
";version$
360 PRINT"Command action extra"
370 PRINT"address byte"
380 REPEAT
390 REPEAT
400 PRINTCHR$(?address);
410 address=address+1
420 UNTIL?address>&7F
430 PRINTTAB(10);~(?address*256)+ad
dress?1;
440 PRINTTAB(10);~address?2
450 address=address+3
460 UNTILaddress>finish
470 PROCwait
480 ENDPROC
490 DEFPROCvdu
500 base=&C3
510 IFversion=0THENTableHi=&C354:Ta

```

Program 1: OS entry addresses

ONE of the first things I like to do with a new operating system is to disassemble it to see how it works.

To be able to do this fully you need to know the entry address for the major routines.

In response to letters and questions at Micro User Shows, Program 1 will provide entry addresses for operating system commands, VDU commands, OSBYTES and OSWORDS. It senses which version of the BBC Micro it is in by an OSBYTE 0 call.

Each action address for OSBYTE and OSWORD is stored in a table as a sequence of pairs lo byte then hi byte.

In the OS command table each keyword is followed by the action address followed by an extra byte. This extra byte provides information such as the OSBYTE number for commands such as *TAPE and *MOTOR.

The VDU table is a little more complex. The lo bytes and hi bytes are stored in a separate table. The hi byte, if greater than &80 is used directly.

If less than &80 the hi nibble – the first hex digit – is added to a base address and the lo nibble determines the number of bytes which are expected to follow the command.

You and your shadow RAM...

THE feature that makes the B+ so different from earlier models is the Shadow RAM. It gets around the problem that has plagued earlier BBC Micros being short of memory when high resolution graphics are required.

As you would expect, there are numerous calls to handle the screen. Most of these are documented in the OS call summary. At power-on the shadow RAM is off. This has been done for software compatibility with the earlier BBC Micros. The default state can be returned to at any time by pressing the Ctrl and Break keys.

A new command, *SHADOW, controls the switching of the shadow RAM.

*SHADOW 0 selects shadow mode.

*SHADOW 1 selects non-shadow mode.

However, the call does not work immediately, but is "queued" for action at the next mode change.

In Basic it's more convenient to use the MODE command – Mode 0 to 7 – the same as before. Simply adding 128 to the mode number switches the shadow RAM on as well as changing mode.

... and how to use it

IT'S getting pretty hard to find any spare space in the BBC Micro for extra functions that will not interfere with the operating system, languages, filing system or utility ROMs.

So finding ideas for the extra Paged RAM from &8000 to &AFFF wasn't difficult.

Acorn recommends that for future compatibility this RAM is under control of the current language.

However the new User Guide mentions: "RAM locations &A000 to &AFFF should only be used for user

supplied VDU driver machine code programs".

Now let's explore the possibilities...

Paged RAM memory is not altered by pressing the Break key – unless *FX200 is called – so we can use it in order to preserve variables. After all, accidentally pressing the Break key during a program or "dropping out" due to an error can be at the least a nuisance, or if you had typed in a lot of data that hadn't been saved, extremely annoying – for want of a better expression.

All the variables that are stored are


```

bleLo=&C333
520 IFversion=1THENTableHi=&C354:Ta
bleLo=&C333
530 IFversion=2THENTableHi=&C34B:Ta
bleLo=&C32A
540 PRINT"VDU action addresses for
OS "version$
550 FORvdu=0TO31
560 PRINTvdu;
570 hi=vdu?TableHi
580 IFhi<128THENhi=base+(hiDIV16)
590 PRINT" &";hi*256+vdu?TableLo
600 NEXT
610 PRINT"VDU 32 onwards:- &";(vdu
?TableHi)*256+vdu?TableLo
620 PROCwait
630 ENDPROC
640 DEFPROCosbyte
650 IFversion=0THEN start=&E56:cha
nge=116
660 IFversion=1THEN start=&E5B3:cha
nge=116
670 IFversion=2THEN start=&E536:cha
nge=113
680 PRINT"Osbyte Action Addresses f
or OS";version$
690 fx=0:table=0
700 REPEAT
710 PRINT"fx," OSBYTE "fx" &"!(st
art+table*2)AND&FFFF
720 IFfx=21THENfx=change
730 fx=fx+1:table=table+1
740 UNTILfx=161
750 PRINT"OSBYTES 166 to 255 direc
ted to:- &"!(start+table*2)AND&FFFF
760 PROCwait
770 ENDPROC
780 DEFPROCosword
790 IFversion=0THEN start=&E5F8
800 IFversion=1THEN start=&E63B
810 IFversion=2THEN start=&E5C4
820 PRINT"Osword Action Addresses f
or OS";version$
830 fx=0:table=0
840 REPEAT
850 PRINT"fx," OSWORD "fx" &"!(st
art+table*2)AND&FFFF
860 fx=fx+1:table=table+1
870 UNTILfx=14
880 PROCwait
890 ENDPROC
900 DEFPROCwait
905 *FX15,1
910 PRINT"Press space bar to conti
nue"
920 REPEAT:UNTILGET=32
930 ENDPROC
940 DEFPROCprint
950 PRINT"Printer (Y/N)?"
960 REPEAT:prX=GET AND&DF:UNTILprX=
89 OR prX=78
970 CLS
980 IFprX=89THEN VDU2,15 ELSE VDU3,
14
990 ENDPROC

```

```

10 REM Keep variable pointers
20 REM (C) The Micro User
30 REM For model B+ only
40 PROCdummy
50 teststring$="I'M HERE"
60 PROCstore
70 CLEAR
80 PROCpulls
90 PRINTteststring$
100 END
110 DEFPROCpulls
120 AX=5:XX=&70
130 YX=0
140 FORIX=&482 TO&4F9
150 !&70=&FFFE8000+IX
160 CALL &FFF1
170 ?IX=?&74
180 NEXT
190 ENDPROC
200 DEFPROCstore
210 AX=6:XX=&70
220 YX=0
230 FORIX=&482 TO&4F9
240 !&70=&FFFE8000+IX
250 ?&74=?IX
260 CALL &FFF1
270 NEXT
280 ENDPROC
290 DEFPROCdummy:ENDPROC

```

Program II: Preserving variables across Break

pointed to by a table in Page &4. If this section of memory is saved it can easily be replaced, restoring the pointers and therefore the variables themselves.

Program II shows this in practice.

The important part of the program is the two procedures, PROCstore which stores the pointers and PROCpulls which replaces the pointers.

The OSWORD calls used have the advantage of working across the Tube.

The only variables used within the procedures are resident variables which are not altered by initialising Basic when the Break key is pressed or when RUN or NEW is entered.

Procedure names are also held along with variables after the end of the program, so to prevent any corruption of the variables a dummy procedure

should be defined, with exactly the same length of name as the procedure that restores the pointers.

In Program II the CLEAR statement in line 70 will wipe the variable pointer table. If you wonder whether anything is happening, just omit line 80 and wait for the error message...

THERE'S a new User Guide to go with all this. It's very similar to the old, apart from smaller print allowing more information on each page. While more of the OS calls are documented, the Advanced User Guide will still be a requirement for serious users.

A separate DFS guide is also included but this is merely the 1983 version with an addendum sheet.

Making it clear

ONE utility I found necessary was to clear the paged RAM memory. This is because when it is first initialised some locations have zeros and 255s written into it by the OS. Also it's helpful to clear the clutter after you've been experimenting for a while.

Program III produces a short machine code routine which is automatically saved to disc. This can then be called by the new command *CLEAR. It will run in the I/O processor if the Tube is active.

Extra storage

THE extra RAM can be used as extra variable storage space, for long programs which need a large amount of data. In this case we will have to do some of the functions of memory management that Basic would normally do.

The RAM should first be cleared so you know you're starting from scratch.

Reading and writing single bytes to the RAM is easily accomplished with OSWORD calls. However, it's more interesting if integers or strings can also be stored. Programs IV, V and VI do the


```

10 REM clear RAM
20 REM (C) The Micro User
30 REM For Model B+ only
40 DIM code 40
50 PX=code
60 [OPT 0
70 LDA &F4 \socket no. current R
ON
80 STA &70 \store it
90 LDA &80 \no. for RAM
100 STA &F4

110 STA &FE30 \ROM/RAM switch
120 STA &73 \store MSB of start p
ageRAM
130 LDA #0
140 STA &72 \set LSB pageRAM
150 .outerloop
160 LDY #0
170 .innerloop
180 STA (&72),Y \write 0 to RAM
190 INY
200 BNE innerloop

210 LDY &73
220 INC &73 \increment MSB
230 CPX &80 \check whether MSB pa
st end of RAM
240 BNE outerloop
250 LDA &70 \get stored ROM no.
260 STA &F4 \restore to page0 ima
ge
270 STA &FE30 \reset ROM/RAM switch
280 RTS:]
290 OSCLI("SAVE CLEAR FFFF"+STR$(c
ode)+" +28 A00 A00")

```

Program III: Clearing paged RAM

```

10 REM PageRAM Read/Write
20 REM (C) The Micro User
30 REM For Model B+ only
40 *CLEAR
50 OSWORD=&FFF1
60 DIM buf% 5
70 REPEAT
80 PRINT "Read, Write or End (W/R/
E)? ";
90 REPEAT:opt%=INSTR(" RrWwEe",GET
$)/2
100 UNTILOpt%
110 ON opt% GOSUB 130,160,210
120 UNTILFALSE

130 INPUT "Read which position ",po
s
140 PRINTFNread(pos)
150 RETURN
160 INPUT "Write which position ",p
os
180 INPUT "Value ",val
190 PROCwrite(pos,val)
200 RETURN
210 CLS:END
220 DEFFNread(off)
230 IF off<0 OR off>12287 THENPRINTC
HR$7"Out of range":ENDPROC
240 !buf%=&FFFE8000+off

250 AX=5
260 XX=buf%
270 YX=buf% DIV256
280 CALL OSWORD
290 =buf%74
300 DEFPROCwrite(off,val)
305 IF off<0 OR off>12287 THENPRINTC
HR$7"Out of range":ENDPROC
310 !buf%=&FFFE8000+off
320 AX=6
330 XX=buf%
340 YX=buf% DIV256
350 buf%74=val
360 CALL OSWORD
370 ENDPROC

```

Program IV: Reading/Writing a single byte to paged RAM

```

10 REM PageRAM Integer Read/Write
20 REM (C) The Micro User
30 REM For Model B+ only
40 *CLEAR
50 OSWORD=&FFF1
60 DIM cmd 5
70 REPEAT
80 PRINT "Read Write or End (R/W/E
)? ";
90 REPEAT:opt%=INSTR(" RrWwEe",GE
T$)/2
100 UNTILOpt%
110 ON opt% GOSUB140,170,210
120 UNTILFALSE
130 END
140 INPUT "Read Which position",pos

150 PRINTFNreadInt(pos)
160 RETURN
170 INPUT "Write which position",po
s
180 INPUT "Value ",TX
190 PROCwriteInt(pos)
200 RETURN
210 END
220 DEFFNreadInt(off)
230 IF off>3071 OR off<0 THEN PRINT
CHR$7"Out of range":=0
240 AX=5
250 XX=cmd
260 YX=cmd DIV256
270 var=0
280 FORLX=0TO3

290 !cmd=&FFFE8000+off*4+LX
300 CALL OSWORD
310 LX?&450=cmd74
320 NEXT
330 =TX
340 DEFPROCwriteInt(off)
350 IF off>3071 OR off<0 THEN PRINT
CHR$7"Out of range":ENDPROC
360 AX=6
370 XX=cmd
380 YX=cmd DIV256
390 FORLX=0TO3
400 !cmd=&FFFE8000+off*4+LX
410 cmd74=LX?&450
420 CALL OSWORD
430 NEXT
440 ENDPROC

```

Program V: Reading/Writing an integer to paged RAM

From Page 93

trick. The integer read/write program shows how this can be done.

I've "cheated" a little by using a resident variable to pass the value. This saves writing Basic code which would

otherwise be needed to ensure proper handling of negative numbers. The location of T% at &450 is easy to remember.

Strings take up a lot of space. The total length of the string is one longer than the actual length to provide an

extra byte to store this actual length.

To make coding simple, the strings have been set to a total length of 25 bytes. This will space for storage of about 490 strings. Reducing the total length will increase the number of strings that can be stored.

```

10 REM PageRAM Strings Read/Write
20 REM (C) The Micro User
30 REM For Model B+ only
40 OSWORD=&FFF1
50 DIM cmd 5
70 *CLEAR
80 tlen=25
90 alen=tlen-1
100 maxno=INT(&2FFF/tlen)
110 REPEAT
120 PRINT "Read Write or End (R/W/E
)?";
130 REPEAT:opt%=INSTR(" RrWwEe",GET
$)/2
140 UNTILopt%
150 ON opt% GOSUB170,200,240
160 UNTILFALSE
170 INPUT "Read Which position",pos
180 PRINTFNreadstr(pos)
190 RETURN

200 INPUT "Write which position",po
s
210 INPUT "String ",txt$
220 PROCwritestr(pos,txt$)
230 RETURN
240 CLS
250 END
260 DEFNreadstr(off)
270 IF off>maxno OR off<0 THEN PRIN
TCHR$7"Out of range":=0
280 AX=5
290 XZ=cmd
300 YZ=cmd DIV256
310 txt$=""
320 !cmd=&FFFE0000+off*tlen
330 CALL OSWORD
340 len=cmd?4
350 IFlen=0THENPRINTCHR$7"No string
there!":=txt$
360 FORLX=1TOlen
370 !cmd=&FFFE0000+off*tlen+LX

380 CALL OSWORD
390 txt$=txt$+CHR$(cmd?4)
400 NEXT
410 =txt$
420 DEFPROCwritestr(off,txt$)
430 IF off>maxno OR off<0 THEN PRI
NTCHR$7"Out of range":ENDPROC
440 IFLEN(txt$)=0 OR LEN(txt$)>alen
THENPRINTCHR$7"Length error":ENDPROC
450 AZ=6
460 XZ=cmd
470 YZ=cmd DIV256
480 !cmd=&FFFE0000+off*tlen
490 cmd?4=LEN(txt$)
500 CALL OSWORD
510 FORLX=1TOLEN(txt$)
520 !cmd=&FFFE0000+off*tlen+LX
530 cmd?4=ASC(MID$(txt$,LX,1))
540 CALL OSWORD
550 NEXT
560 ENDP

```

Program VI: Reading/Writing strings to paged RAM

Machine code

THE new User Guide suggests that machine code can be run in paged RAM but gives no details of how it can be done.

Placing the code there is no problem. Short pieces of code are easily placed with OSWORD 6. Longer sections could be loaded into ordinary RAM before a short piece of machine code switches in paged RAM then transfers the code.

Calling the code requires more thought. One way is to write a short piece of code which could switch in the paged RAM before calling it as a subroutine, then switch back to the current ROM. For example:

```

LDA &F4
STA &70
LDA &000
STA &F4
STA &FE30
JSR &0000
LDA &70
STA &F4
STA &FE30

```

This method is to say the least, rather laborious. Let's have a look at an alternative way. Built into the operating system is the system of extended

	Page &2 loc (LSB),(MSB)	Page &FF address	Page &D loc (LSB),(MSB), ROM/RAM no.
IND1V	&230,&231	&FF48	&DE7,&DE8,&DE9
IND2V	&232,&233	&FF4B	&DEA,&DEB,&DEC
IND3V	&234,&235	&FF4E	&DED,&DEE,&DEF,

Table 1: User Vectors

vectors. This looks rather complex at first sight, but all that is required is to alter a few vectors and the operating system does the rest.

In Page &2 there is a set of vectors for the main operating systems calls. They will contain the address that the call is to jump to be implemented. Often this will be to the operating system itself.

Sometimes this may not be in the main memory but in a paged ROM – as with the DFS. Here extended vectors are used. In this case each jump address is stored in Page &D along with its ROM number.

To get to these the operating system uses a rather clever trick. The page &2 vectors point to a subroutine in Page &FF. The lower part of Page &FF is a series of JSR &FF51.

Since a JSR stores a return address on the 6502 stack, the routine at &FF51 will use the return address as an offset into Page &D hence finding the correct

ROM and action address.

Confused? I must admit I was to begin with. An example using IND1V should make this clearer.

The address of the code you want to jump to should be placed in &DE7 (LSB) and &DE8 (MSB). The ROM number is placed in &DE9. The vectors in page&2 addresses are changed to point to &FF48 – the Page &FF address of IND1V – by placing &48 in &230 and &FF in &231.

So what has this to do with paged RAM? Simply that if instead of using a ROM number a byte with the most significant bit set – that is, 128 to 255 – will switch in the paged RAM.

As long as you jump to the correct place in the code, perform an RTS at the end of the code and don't upset the return address on the stack, there should be no problems! Table 1 lists the user vectors available to you.

10 REM Screen fill routine	160 LDA table,Y	320 .end	480 FORIX=1TO255
20 REM (C) The Micro User	170 BEQ end	330 RTS	490 VDU23,2,IX,0,0,0,0,0,0
30 REM For Model B+ only	180 STA &D7	340 .table	500 PRINTTAB(0,30);IX;
40 OSWORD=&FFF1	190 LDA #0	350 EQUW &3030	510 G=GET
50 OSBYTE=&FFF4	200 STA &D6	360 EQUW &30	520 NEXT
60 DIM code% 60	210 LDA &31C	370 EQUW &5858	530 END
70 DIM BX 10	220 .outerloop	380 EQUW 0	540 DEFPROCstore
80 FOR passX=0 TO 3 STEP3	230 LDY #0	390 J	550 AX=6:IX=BX
90 PX=codeX	240 .innerloop	400 NEXT	560 YX=BX DIV256
100 [	250 JSR &FFB3	410 PROCstore	
110 OPT passX	260 EOR #&FF	420 ?&DD8=0	570 FORIX=0 TO PX-codeX
120 CMP #2	270 INY	430 ?&DD9=&80	580 !BX=&FFFE0000+IX
130 BNE end	280 BNE innerloop	440 ?&DDA=&80	590 BX?4=IX?codeX
140 LDA #&87	290 INC &D7	450 ?&226=&39	600 CALL OSWORD
150 JSR OSBYTE	300 LDX &D7	460 ?&227=&FF	610 NEXT
	310 BPL outerloop	470 MODE4	620 ENDPROC

Program VII: Screen fill routine

Having a screenful...

AS a final example, Program VII, a screen fill routine, adds another command to VDU23.

With VDU23 a number just after the "23" between 2 and 31 inclusive is

directed through the unrecognised VDU vector - unrecognised, that is, unless you have Acornsoft's GXR ROM. VDU.23.2 is followed by a number between 0 and 255. These numbers produce different screen patterns.

Remember with all VDU23 commands to make sure that a total of nine numbers follow the 23.

In this example the VDU vector was used, but the three user defined vectors shown in Table I are available.

1770 DFS

THE good news is that at last Acorn has given up the 8271, selecting the 1770 floppy disc controller, the same as that used in the Electron Plus 3.

The bad news is that it is still only a single density system.

Pity they did not implement either a double density version of the DFS or

OS call summary

OSBYTE 0 is used to display the full MOS version.

On entry A=0 and X=0 will print the OS version.

On entry A=0 and X<>0 will return in X a value corresponding to the OS as below:

X = 0 OS 1.00
X = 1 OS 1.20
X = 2 OS 2.00

This can be done from Basic with two lines of code:

```
AX = 0 : XZ = 255
version = ((USR &FFF4) AND &FFF)
DIV 256
```

OSBYTE 114 (A=&72): Set shadow mode state - exactly the same as *SHADOW.

On entry X=0 selects shadow screen memory. X=1 selects non-shadow screen memory.

On exit X contains the previous state. This call is implemented at the next mode change, NOT immediately.

OSBYTE 117 (A=&75): Read VDU status. The previously undefined bit 4 of the status byte is now flags the actual shadow state. It is set on when

the shadow RAM is active, off when not.

OSBYTE 129 (A=&81): Read display MOS version. This is a special case of "Read keys within the time limit" - INKEY.

On entry X=0 and Y=255.

X = 0 BBC A/B version 0.1
X = 1 Electron
X = &FA (-6) ABC
X = &FB (-5) BBC B+ version 2.00
X = &FE (-2) BBC USA version
X = &FF (-1) BBC A/B versions 1.00/1.20

The Basic equivalent is INKEY (-256).

OSBYTE 132 (A=&84): Read bottom of display RAM address. This returns &8000 in X (LSB) and Y (MSB) if Shadow is in operation.

OSBYTE 133 (A=&85): Read bottom of display RAM address for a specified mode. This returns &8000 in X (LSB) and Y (MSB) if shadow in operation or pending.

OSBYTE 239 (A=&EF): Read/write shadow mode state.

OSWORD 5: Read I/O memory. If

the top two bytes of the extended address are set to &FFFE the RAM between &8000 and &AFFF can be read.

OSWORD 6: Write I/O memory. RAM between &8000 and &AFFF can be written to by setting the top two bytes of the four-byte address to &FFFE.

OSWRSC (&FFB3): Writes the byte in the accumulator to the screen. The actual screen location must be placed in &D6 (LSB) and &D7 (MSB). Call only available from I/O processor, not across the Tube.

OSRDSC (&FFB9): Read screen/ROM. This call has been renamed, it was formally OSRDRM.

Point to memory location to be read by placing address in &F6 (LSB) and &F7 (MSB). The type of memory read depends on the location.

Address below &3000: Reads main RAM.

Address between &3000 and &7FFF: Reads the screen.

Address above &7FFF: Reads a ROM, number in A at entry. Call only available from I/O processor, not across the Tube.

offer the Advanced Disc Filing System that the Electron can have. Anyway, Table II gives a summary of benchmarks for the system.

One problem that quickly became apparent was that certain discs would not work with this system, even some copies of Acornsoft games, due to software protection.

Some types of protection depend on the older 8271 chip being present which means that they will either have to change the protection technique or tailor them just for the 1770.

There are a number of calls extra to the earlier DFSs:

***CLOSE** will close any open files.

***DRIVE** is now extended so that a drive on an 80 track drive can be set to read a 40 track disc.

***EX** is similar ***INFO**

***EX** is equivalent to ***INFO ***

EX *** is equivalent to ***INFO *

***FORM** - at last a built-in disc formatter.

***FREE** displays the total and used space on a disc. For example:

17 Files 2C9 sectors 182,528 bytes Free
14 Files 057 sectors 22,272 bytes Used

DFS	0.90	1.20	2.0j
1 OPEN + CLOSE files*1000	4.3	5.1	6.6
2a PRINT 1000 numbers	15.7	6.7	6.4
2b PRINT 100 strings	61.0	24.8	25.3
3a INPUT 1000 numbers	12.6	5.8	6.0
3b INPUT 100 strings	57.1	23.0	24.2
4 BPUT 1000 bytes	5.0	3.4	3.5
5 BGET 1000 bytes	3.9	2.5	3.2
6 Move PTR 1000 places	2.2	2.2	2.9
7a Write test relative file	62.9	25.9	26.4
7b Read test relative file	50.4	23.5	24.6
8a Write relative file backwards	240.3	99.6	97.4
8b Read relative file backwards	99.9	39.2	40.5

Table II: DFS Benchmarks

***MAP** displays the areas of the disc that are free for use, giving the start sector and the number of sectors in each segment.

Address : Length
017 : 002
027 : 027
05A : 0B9
11A : 206

***ROMS** - a surprising command for a

DFS. It lists the ROMs in the machine, giving their ROM number and whether they have language and/or service entries, for example:

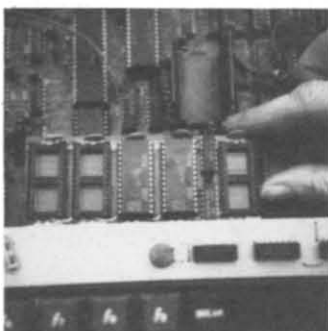
ROM : 15 (L) Basic
ROM : 11 (S) DFS 2.0

***VERIFY**, now also built-in. No need to hunt for the disc utility disc every time you want to format or verify a disc.

UP TO 32k SIDEWAYS RAM BD FOR THE BBC PLUS CAPABILITY OF WRITE PROTECTION INCLUDED

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MU 9

MICHAEL NOELS reviews Acornsoft's Graphics Extension ROM and asks: Has it been worth the wait?

NOT that I'm biased, but I've always regarded the BBC Micro's graphics capabilities as far in excess of its rivals. However good I claimed them to be though, there was always a chink in my armour – and Spectrum owners found it all too frequently.

"What's the BBC Micro's CIRCLE command like, then?" they'd ask ingenuously, knowing full well the only shape it was capable of filling was a triangle. Now, with the advent of Acornsoft's long-awaited Graphics Extension ROM, GXR, I can treat Spectrum freaks with the disdain they deserve.

Circle commands there are, and ellipses, both in outline and filled, plus arcs. In addition there are filled rectangles, parallelograms, sectors and segments available – all via extensions of the PLOT command. There are also some superb flood fill routines, with user-defined colour patterns giving you a tremendous range of graphic textures. In addition, the GXR supports sprite graphics.

And when you consider it comes with a tape full of utilities and examples, you can see the system is worth serious consideration.

The package comes on a 16k ROM which plugs into a spare sideways socket as usual. On power up – if you plug it into an even socket number – you won't notice it's there, as it needs to be activated with *GXR followed by Break. This will shift the value of PAGE up by &300.

Irritatingly, if it's in an odd numbered socket, it claims this workspace immediately on power up. Actually &200 bytes of this is reserved for the flood fill routines. If you're not using them, you can release this space by entering *NOFLOOD, followed by Break. It's re-allocated by *FLOOD.

You can turn the GXR off, and so return PAGE to its normal limits in three ways – with *NOGXR, by pressing Ctrl + Break, or by powering down then up again (assuming an even socket).

As soon as I'd fitted the ROM I tried out the new shapes and, as they're very much analogous to the old PLOT commands, it wasn't too difficult.

The idea is to visit enough points to define the shape, using the necessary number of MOVES followed by a PLOT with the appropriate PLOT number.

You probably haven't given it much thought, but to define a rectangle you

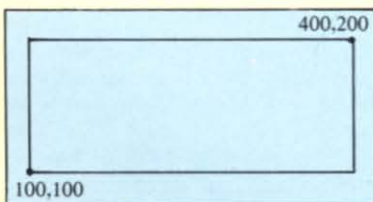


Figure 1: Defining a rectangle

need only to specify diagonally opposite corners. For example, if you know that the bottom left corner is at 100,100 and the top right corner at 400,200 you know what the rectangle looks like – see Figure 1 if you don't.

So what we'd do to draw it is include one of the points in a MOVE statement and then do one of the GXR's fancy rectangle PLOTs including the coordinates of the second point.

I say *one* of the rectangle plots since there are in fact eight ways of plotting rectangles – PLOT &60 to PLOT &67. Actually these are the offset options

we're already used to with PLOT when dealing with triangles. Table 1 summarises them.

In our examples we'll tend to use an offset of 5, which fills the rectangle in the current graphics foreground colour. That is, we'll use PLOT &65.

So to draw the rectangle in Figure 1 our code will be:

```
10 MOVE 100,100
20 PLOT &65,400,200
```

Couldn't be simpler, could it? If we'd



Plot offset	Effect
0	Move relative.
1	Draw relative in the current graphics foreground colour.
2	Draw relative in the logical inverse colour.
3	Draw relative in the current graphics background colour.
4	Move to absolute position.
5	Draw absolute in the current graphics foreground colour.
6	Draw absolute in the logical inverse colour.
7	Draw absolute in the current graphics background colour.

Table 1: Effects of PLOT offsets

GXR fills that gap

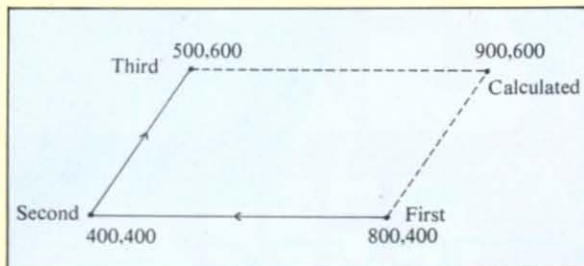


Figure II: Defining a parallelogram

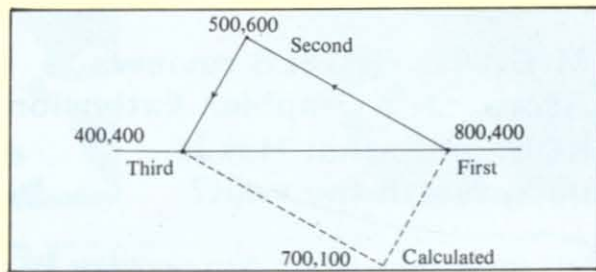


Figure III: Same points, different order

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used PLOT &67, the rectangle would have appeared in the graphics background colour.

Creating parallelograms isn't difficult either. In fact it's easier than spelling them. To specify them, we need to visit three "consecutive" corners – twice with MOVE and finally with the relevant PLOT. The GXR ROM can then work out the other corner and plot the parallelogram.

The order you visit the points in has a lot to do with the end result. As Figures II and III show, visiting the same points in different orders can create completely different parallelograms.

Program I shows how these rectangle and parallelogram drawing techniques



```
10 REM PROGRAM II
20 MODE 2
30 VDU 23,1,0;0;0;0;
40 fill% = 0
50 REM When fill% = 0, line 110 plots outline. When fill% = 8, line 110 fills in.
60 REPEAT
70 CLG
80 FOR radius% = 300 TO 100 STEP -100
90 GCOL 0,radius% DIV 100
100 MOVE 640, 512: REM Centre
110 PLOT &95 + fill%, 640 + radius% , 512: REM Point on circle
120 NEXT radius%
130 PRINT TAB(4,28) "Press Space"
140 REPEAT UNTIL INKEY(-99)
150 fill% = 8 - fill%
160 UNTIL 0
```

Program II

can be combined to draw a box shape.

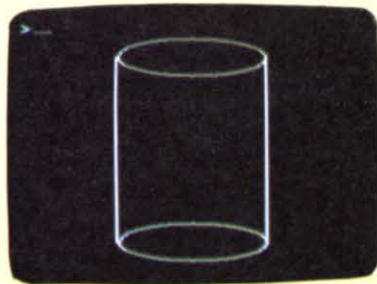
Parallelograms and rectangles are always drawn filled. When it comes to circles though, we have a choice. If we want just an outline, we use PLOT codes &90 to &97. If we want them filled, &98 to &9F will do the trick. Either way, you simply visit the centre of the circle with MOVE, then PLOT to a point on the circumference. Program II gives an example of both filled and unfilled circles.

We can also choose to outline or fill our ellipses, &C0 – &C7, &C8 – &CF respectively. Defining them is a bit trickier though, we have to visit three points in all. After an initial sortie to the

centre of the ellipse we must then MOVE to the outermost point at centre height – to the left or right of centre. Finally we use the highest or lowest point of the ellipse in our PLOT statement.

In practice this is quite simple, as Program III shows. Program IV uses the ellipse outline commands to create a pretty pattern. We firstly stripe the screen alternate colours by drawing rectangles, then PLOT our ellipses. Notice that this time we're using PLOT &C6 – in other words an offset of 6 – which inverts the background colour.

Three other sets of PLOTs related to

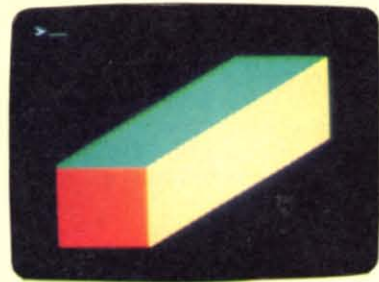


```
10 REM PROGRAM III
20 MODE 2
30 REM Draw outline of two ellipse
40 FOR offset% = 0 TO 700 STEP 700
50 MOVE 600,200 + offset%: REM Centre
60 MOVE 850,200 + offset%: REM outermost point
70 PLOT &C5,600,275 + offset%: REM Highest point
80 NEXT offset%
90 REM Draw sides
100 MOVE 350,200: DRAW 350,900
110 MOVE 850,200: DRAW 850,900
```

Program III

circles give us arcs, sectors and segments – Table II summarises these, along with the other figures we've just covered.

This time, since we're dealing with



```
10 REM PROGRAM I
20 MODE 2
30 REM Rectangle for "face"
40 GCOL 0,1
50 MOVE 100,200
60 PLOT &65,400,500
70 REM Plot top parallelogram
80 GCOL 0,2
90 MOVE 100,500
100 MOVE 700,900
110 PLOT &75,1000,900
120 REM Plot side parallelogram
130 GCOL 0,3
140 MOVE 1000,600
150 PLOT &75,400,200
```

Program I

Shape	Plot codes	Defined by	Example	Diagram
Rectangles (Filled)	&60-&67 96-103	Two diagonally opposite points	MOVE 100,100 PLOT &65,600,400	
Parallelogram (Filled)	&70-&77 112-119	Three corners in sequence - order of "visit" vital	MOVE 100,100 MOVE 400,200 PLOT &75,400,400	
Circles (Outline)	&90-&97 144-151	<u>Filled or unfilled</u> Two points: Visit centre then point on circumference	MOVE 640,512 PLOT &95,840,512	
Circles (Filled)	&98-&9F 152-159		MOVE 640,512 PLOT &9D,640,712	
Ellipses (Outline)	&C0-&C7 192-199	<u>Filled or unfilled</u> Three points. Visit: 1. Centre point 2. Outermost point at centre height 3. Highest or lowest point	MOVE 640,512 MOVE 940,512 PLOT &C5,640,712	
Ellipses (Filled)	&C8-&CF 200-207		MOVE 640,512 MOVE 840,512 PLOT &CD,940,712	
Arcs	&A0-&A7 160-167	<u>Arcs, Sectors, Segments</u> Three points. Visit: 1. Centre of circle 2. Starting point on circumference 3. A point on a line, (not necessarily on circumference), that marks end of arc, that is, defines the angle. Arcs etc. are drawn anti-clockwise.	MOVE 640,512 MOVE 640,712 PLOT &A5,300,512	
Sectors (Filled)	&B0-&B7 176-183		MOVE 640,512 MOVE 840,512 PLOT &B5,640,100	
Segments	&A9-&AF 168-175		MOVE 640,512 MOVE 800,700 PLOT &AD,480,700	

Table II: Geometric shapes available with GXR

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fractions of a circle, the technique is different. We visit the centre of the circle and then the point on the circumference we want our figure to start from. We then specify a third point – not necessarily on the circumference – that

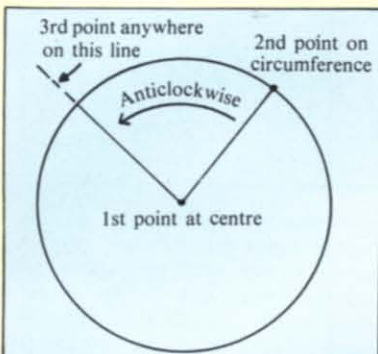
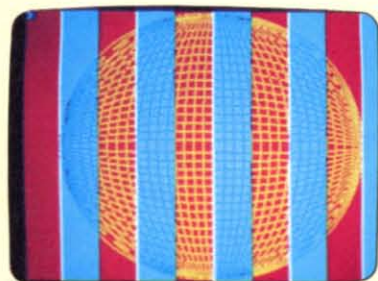


Figure IV: Specifying arcs, sectors and segments

tells us how much of the circle we want. The line between the centre and this third point acts as the finishing line for the PLOT.

Figure IV shows the idea. Notice that



the plot goes in an *anticlockwise* direction from the start line.

There's also an extremely neat way of moving or duplicating rectangles on the screen. We simply "surround" the area under consideration with a rectangle by MOVEing to two opposite corners, then specify in our PLOT statement a third point that becomes the bottom lefthand corner of the "target" rectangle.

The plot codes for these Copy/Move options are &BB to &BF. They don't correspond to Table I however. The meanings of individual values are shown in Table III.

Program V uses the arc and sector routines to draw a patterned circle in at the bottom left of the screen. We then copy this over the whole area of the screen – far faster than drawing each of the circles individually.

As well as providing these fundamental geometric shapes, the graphics ROM also allows you to decide the pattern with which shapes will be flood filled – that is, painted in – and lines will be drawn. Its versatility and ease of use make this – together with the flood fill commands themselves – one of the most powerful features of the ROM.

You can have four colour patterns defined at one time, calling them via the following GCOLS:

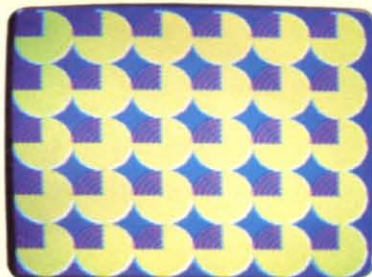
```
GCOL 16,0 pattern 1
GCOL 32,0 pattern 2
GCOL 48,0 pattern 3
GCOL 64,0 pattern 4
```

As we'll see in a moment, the actual effects of the use patterns vary with the mode you're in. The 0 is necessary to show it's a foreground colour you're

Plot code	Effect
&B8	Move only, relative.
&B9	Move rectangle relative.
&BA	Copy rectangle relative.
&BB	Copy rectangle relative.
&BC	Move only, absolute.
&BD	Move rectangle absolute.
&BE	Copy rectangle absolute.
&BF	Copy rectangle absolute.

Table III: Moving screen areas

setting. 128 and over would mean it's a background colour used in conjunction with the offset options. CLG does not



```
10 REM PROGRAM V
20 MODE 1
30 VDU 19,0,4,0,0,0
40 VDU 23,1,0;0;0;0;
50 REM Draw arcs
60 FOR start% = 200 TO 110 STEP -1
0
70 GCOL 0,1
80 MOVE 100,100 : REM Centre
90 MOVE 100,start% : REM Start
100 PLOT &A5,0,100: REM Angle
110 NEXT start%
120 REM Draw sector
130 GCOL 0,2
140 MOVE 100,100: REM Centre
150 MOVE 0,100: REM Start point
160 PLOT &B5,100,200: REM Angle
170 REM Replicate rectangle contain
ing whole figure all over screen.
180 increment% = 200
190 FOR vertical% = 0 TO 800 STEP i
ncrement%
200 FOR horizontal% = 0 TO 1000 STE
P increment%
210 REM Define rectangle to be copi
ed
220 MOVE 0,0: REM Bottom left
230 MOVE 200,200: REM Top right
240 REM Now copy to identical recta
ngle with bottom left as defined in P
LOT &BE
250 PLOT &BE, horizontal%,vertical%
260 NEXT horizontal%
270 NEXT vertical%
```

Program V

```
10 REM PROGRAM IV
20 MODE 1
30 VDU 19,0,4,0,0,0
41 VDU 19,3,0,0,0,0
50 VDU 23,1,0;0;0;0;
60 colour% = 1
62 REM =====
65 REM Stripe screen alternate col
ours by drawing rectangles
70 FOR left% = 0 TO 1152 STEP 128
80 GCOL 0,colour%
90 MOVE left%,0 : REM Bottom left
100 PLOT &65,left%,127,1023: REM To
p right
110 colour% = 4 - colour%
120 NEXT left%
122 REM =====
125 REM Draw ellipses ( starting as
circles) full height of screen, decr
```

```
easing "width"
130 FOR outer_point% = 1152 TO 672 S
TEP -32
140 MOVE 640,512 : REM Centre
150 MOVE outer_point%, 512
160 PLOT &C6,640,1023: REM highest
point of ellipse
170 NEXT outer_point%
172 REM =====
175 REM Draw ellipses ( starting as
circles) full width of screen, decre
asing "height"
180 FOR top_point% = 991 TO 512 STEP
-32
190 MOVE 640,512 : REM Centre
200 MOVE 1152,512 : REM Outermost p
oint of ellipse, at centre height
210 PLOT &C6,640,top_point%
220 NEXT top_point%
```

Program IV

clear to the user defined background pattern, however.

Four rather uninteresting default patterns are already set up for you. Program VI demonstrates their effects in various modes. You can, however, define your own using VDU 23, much as you would a user defined character:

VDU 23,2 gives pattern 1
VDU 23,3 gives pattern 2
VDU 23,4 gives pattern 3
VDU 23,5 gives pattern 4

Each of these is followed by eight parameters specifying the pattern you want.

In a two-colour mode things are quite straightforward. Just as in a standard user defined character, each parameter specifies a row, the colour of each pixel corresponding to the state of each bit of the parameter. Once defined and initialised with the appropriate GCOL this "user defined character" will be used as the pattern to fill with.

In other modes you need more than one bit to a pixel, so the analogy with user-defined graphics breaks down. For instance, in a four colour mode you need two bits to define the colour. If you do your sums, this means that one parameter, which is eight bits long, can only define four pixels. Sixteen colour modes need four bits to a colour, so only two pixels are defined by a parameter.

Worse still, the bits are interwoven within the parameter, as you'll have found if you've ever attempted machine code graphics.

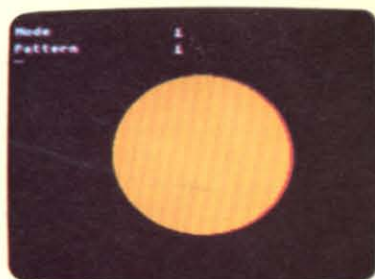
Fortunately an editor is included with the package which makes defining patterns simplicity itself.

It's well worth defining your own patterns – the power it gives you to mix the BBC Micro's few true colours to produce an almost unlimited range of shades and hues has to be seen to be believed.

When attempting to blend new colours it's best to stick to simple cross hatching and dithering. However you can create rather dramatic background patterns of repeated motifs, diagonal bars, wavy stripes and far, far more, as Program VII sets out to demonstrate.

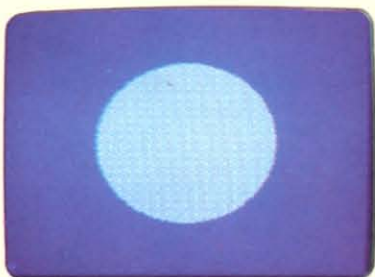
You can also create your own dot-dash pattern for lines. This time you use VDU 23,6 followed by eight parameters. Each bit set to 1 represents a point plotted.

Since you've got eight parameters, each eight bits long, that means you can have a pattern up to 64 pixels long before it starts to repeat itself. In fact you can choose exactly how many points you want plotting before the



```
10 REM PROGRAM VI
20 FOR mode% = 0 TO 2
30 MODE mode%
40 FOR pattern% = 1 TO 4
50 GCOL pattern% * 16,0
60 REM Draw and fill circle
70 MOVE 640,512
80 PLOT 640,512
90 PRINT TAB(0,1) "Mode "mode%
100 PRINT TAB(0,3) "Pattern "pattern%
110 delay$ = GET$
120 NEXT pattern%
130 NEXT mode%
```

Program VI



```
10 REM PROGRAM VII
20 MODE 4
30 VDU 19,0,4,0,0,0
40 REM Define Fill Pattern 1
50 VDU 23,2,449,24,492,449,449,49
2,449
60 REM Activate Pattern 1
70 GCOL 16,0
80 REM Draw and fill circle
90 MOVE 640,512
100 PLOT 640,512
```

Program VII

pattern restarts. You can set up any repeat between 1 and 64 by using:

*FX163,242,n.

where n determines the size of the pattern. n=0 sets a default on-off pattern.

There are four ranges of PLOT numbers for dot-dash lines, each with a different effect, as detailed in Table IV. Program VIII shows the idea in action.

Now we come to the flood fill commands. These routines are superb, fast and very efficient. They're also extremely easy to use – all you need is a shape enclosed by a solid border.

There are two types of fill, flood to

non-background (&80-&87) and flood until foreground (&88-&8F).

With both you simply PLOT to a point inside the boundary you want to fill with the appropriate PLOT number.

If it's a flood to non-background, the shape you're filling must be in the background colour and bordered with a non-background colour. The shape will then be filled in with the current foreground colour, which may be a pattern that you've defined.

With flood until foreground the shape you're filling can be in any colour except the present foreground colour. The shape will then be filled with the present foreground colour. Program IX demonstrates the ideas.

The second half of the graphics ROM provides facilities for designing and displaying sprites in any of the graphics modes – that is 0, 1, 2, 3, 4 and 5. This is a feature the BBC was previously lacking and is an essential must for Basic programmers who need to speed up the action of their games.

Before any sprites can be used memory must be set aside for their

Plot code	Effect
&10-&17	Both end points included. Pattern restarts with each new line.
&18-&1F	Final point omitted. Pattern restarts with each new line.
&30-&37	Initial point omitted. Pattern continues with each new line.
&38-&3F	Both ends omitted. Pattern continues with each new line.

Table IV: Dot-dash line options

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graphic definitions. This is done using *SSPACE *N*, where *N* is the number of pages of memory to be reserved. The value of *N* will depend upon the size and number of sprites required.

Once *SSPACE has been entered you are prompted, yet again, to press Break. PAGE is now raised accordingly. If you use too many sprites you'll end up with very little memory for your program, especially if you're using Modes 0,1 and 2.

One thing I noticed was that *SSPACE with large values, such as 140, reserves the memory specified and PAGE ends up in the middle of the Basic ROM.

The next step is to select the mode in which the sprite is to be used. Entering *SEdit *N* will allow sprite *N* – a value between 0 and 255 – to be designed.

There is also the option to edit one sprite and store it under a different sprite number. Entering *SEdit *X,Y* allows sprite *X* to be edited and saved as sprite *Y*. This is very useful when similar sprites are being designed for animation. Unfortunately there are no commands to animate a series of sprites – you have to do it yourself.

Once the editor has been activated a box is displayed at the bottom left of the screen. This is an enlarged copy of the sprite being edited. Initially the box is only one byte square but this can be increased and decreased by pressing the



```
10 REM PROGRAM IX
20 S=1
30 MODE 5
40 MOVE 640,512
50 FOR X=0 TO 38
60 PLOT 5,100*SIN(X)*S+640,100*CO
S(X)*S+512
70 S=S+0.12
80 NEXT
90 GCOL 0,1
100 PLOT 685,630,512
```

Program IX



```
10 REM PROGRAM VIII
20 MODE 2
30 VDU 19,0,4,0,0,0
40 VDU 23,6,&F3,&33,&D4,0,0,0,0,0
50 *FX163,242,24
60 FOR height% = 0 TO 1023 STEP 8
70 MOVE 0,height%: PLOT 635,1279,h
eight%
80 NEXT height%
```

Program VIII

f3 and f4 keys – a function key strip is supplied to make things easier. The function keys do other things which I'll mention later.

If the sprite being designed is too large to fit on the screen the box acts like a window and can be scrolled over any section of the sprite. This is rather slow, though.

To the right of the box is the sprite in "real size". This makes it much easier to see what the sprite will look like, especially when editing larger ones.

The editing pen, represented by a small circle, is moved around the editing box using the cursor arrows. Pity there isn't a joystick option.

Once the pen has been located correctly the Return key is used to colour the pixel at the editing pen's position. The colour of the pen is shown as a solid block at the top of the screen, and can be changed by pressing keys 0-9 and A-F – this depends on the

number of colours available in the selected mode.

Also at the top of the screen are the pen's current *X* and *Y* positions, the maximum *X* and *Y* values of the sprite and the sprite number.

The function keys provide other features such as flood column or row, reflect vertically or horizontally and pen up/down.

Editing is so easy that pleasing sprites can be created within minutes. When you are satisfied with the sprites in memory they can be saved to tape or disc using the command *SSAVE *filename*. These can then be re-loaded or merged with other sprites using *SLOAD and *SMERGE.

Apart from the rather slow response time when editing large sprites, and the lack of a joystick option, the sprite editor cannot be faulted.

Sprites can also be defined from a rectangular area of the screen using *SGET *N*. The area is defined by the previous two MOVE or PLOT coordinates. For example, entering the following commands will copy the data in the rectangular area (200,200),(264,264) into sprite 0 – assuming enough room has been reserved for the sprite.

```
MOVE 200,200
MOVE 264,264
*SGET 0
```

The sprites in memory can be altered

*HELP SPRITES

Graphics Extension ROM 1.2

Sprite status

```
4 page(s) sprite w/s
709 byte(s) free
3 sprite(s) defined
```

Sprite commands

```
SSPACE n
SCHOOSE n
SDELETE n
SEdit n
SEdit n,m
SGET n
SLOAD filename
SMERGE filename
SNEW
SRENUMBER n,m
SSAVE filename
```

OS 1.20

Figure V: Effect of *HELP SPRITES

‘If you’re wondering what your next upgrade for your BBC Micro should be, look no further’

in several other ways:

- *SRENUMBER *X,Y*: Renumbers sprite *X* as sprite *Y*.
- *SDELETE *X*: Deletes sprite *X*.
- Or
- *SDELETE *X,Y*: Deletes from sprite *X* to sprite *Y*.
- *SNEW: Clears all sprite definitions.

If information is required about the sprites in memory the command *HELP SPRITES will indicate the memory allocation and the sprite numbers – see Figure V.

Before a sprite can be displayed it must be selected using either *SCHOOSE *N* or VDU 23,27,0,N,0,0,0,0,0 – where *N* is the sprite number. The latter option allows a variable to be used to define the sprite number.

The sprites are displayed on the screen using new PLOT options. As with the normal Basic PLOT command GCOL can be used to AND, OR and EOR the sprites onto the screen. I found that most of the time I was using GCOL

3,0 – EOR. Anyone who normally uses VDU 5 to plot characters will be at home with the graphics ROM sprites.

Now that the sprite's number and GCOL options have been selected it can be displayed on the screen. This is achieved using PLOT calls &E8 to &EF followed by the screen *X* and *Y* coordinates. The sprite PLOT commands are the same as PLOT options 0 to 7, but instead of drawing lines a sprite is displayed.

The graphics window can also be used in conjunction with sprites. If one moves outside the graphics window only the part of the sprite inside the window will be displayed. To provide this feature requires several boundary checks in the sprite routines which would, in effect, slow down the sprites. But this doesn't seem to be the case because the sprites can be moved swiftly around the screen.

To show how easily the sprites can be used from Basic take a look at Program X, which shows the code necessary to move a sprite smoothly across the screen from left to right.

The first few lines of the program choose sprite 0 and display it on the screen twice, the second one being offset two pixels from the first. This section of screen is now defined as sprite 1 using *SGET. Now the sprite is moved across the screen using the relative PLOT option, *FX 19 being used to reduce flicker.

Program XI demonstrates the effect a graphics window has on sprites. It allows you to control a sprite using the cursor keys. Any section of the sprite outside the graphics window is not displayed.

To conclude, the sprite section of the graphics ROM is excellent and very easy to use. Using simple Basic commands sprites can be designed and moved around the screen. The only two things the ROM lacks are collision detections and film animation. These

are left for you to figure out.

Acornsoft's Graphics Extension ROM is a great piece of kit. Powerful, yet easy to implement, the new commands restore the BBC Micro to the position it held at its launch – the leading micro for computer graphics. In fact, it seems strange Acorn didn't include it in the B+ as standard.

Of course nothing's perfect. For instance, it would have been nice to have outlined rectangles and parallelograms, together with film animation and collision detection for the sprites.

And that even/odd socket quirk is irritating, as is the need to press Break when you activate the ROM.

Still these are minor blemishes that detract little from its overall excellence.

If you're wondering what your next upgrade for your BBC Micro should be, look no further. But don't expect to borrow mine – it's staying firmly in my machine.

```
10 REM PROGRAM X
20 MODE 2
30 GCOL 3,0
40 *SCHOOSE 0
50 PLOT5+&E8,200,200
60 PLOT5+&E8,216,200
70 MOVE 200,200
80 MOVE 296,244
90 *SGET 1
100 CLS
110 *SCHOOSE 0
120 PLOT5+&E8,0,300
130 MOVE -16,300
140 *SCHOOSE 1
150 FOR LX=0 TO 70
160 *FX 19
170 PLOT1+&E8,16,0
180 NEXT
```

Program X

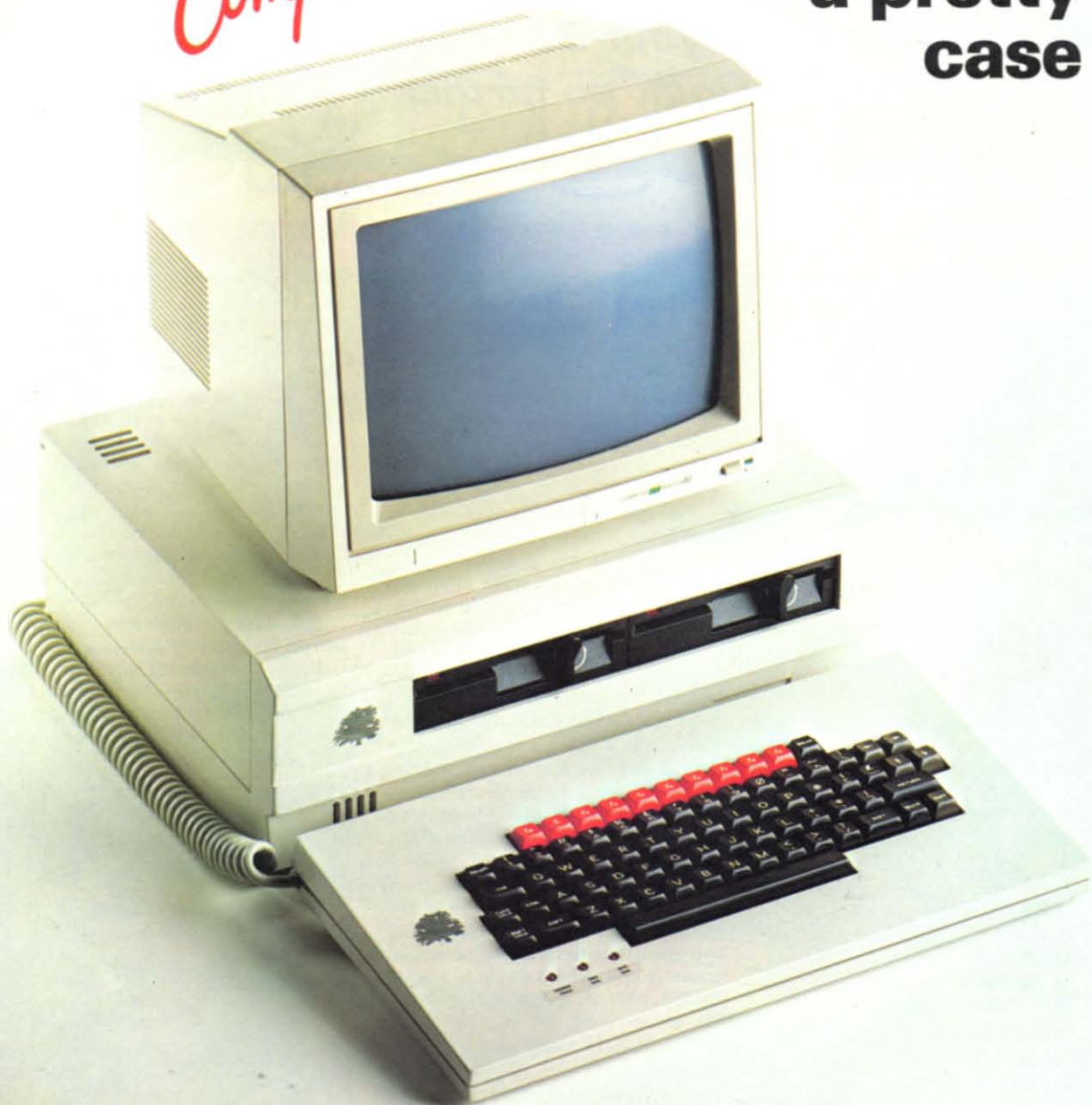
```
10 REM PROGRAM XI
20 MODE 2
30 COLOUR 129
40 CLS
50 VDU24,250,200,1000,000;
60 CLG
70 GCOL 3,0
80 *SCHOOSE 0
90 XX=500:YY=500
100 *FX 19
110 PLOT5+&E8,XX,YY
120 REPEAT
130 RXX=0:RYX=0
140 IF INKEY(-58) THEN RYX=0
150 IF INKEY(-42) THEN RYX=-8
160 IF INKEY(-26) THEN RXX=-16
170 IF INKEY(-122) THEN RXX=16
180 *FX 19
190 IF RXX OR RYX PLOT5+&E8,XX,YY:P
LOT5+&E8,RXX,RYX:RYX=RYX+RXX:RXX=
RXX+RYX
200 UNTIL 1=2
```

Program XI

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LAST month we examined how Basic's ON ERROR statement worked. This month we're going to make use of these ideas to construct our own custom-made error-handling routines.

The jump and branch addresses to which I refer in this article apply only to Basic version I. Basic II uses almost the same code, but it starts at a different address.

I will indicate the addresses of the routines in Basic II by enclosing them in square brackets after the Basic I address. The locations of the various pointers are identical on both versions of Basic and are thus not followed by square-bracketed numbers.

If you hard reset Ctrl+Break your computer and then RUN Program I it will tell you which version of Basic you have and also the addresses of the various routines. The utilities supplied later work on either Basic.

Whenever Basic encounters something which it can't deal with it branches to an error message – branching and jumping are machine code equivalents to Basic's GOTO. The actual message it branches to will, of course, depend on exactly what gave it trouble.

If, for example, Basic tried to execute the following one-line program:

```
10 A=10:PRINT B
```

it would do something similar to the following:

- Make variable A equal 10 and delete the old value of A if there is one.
- Get ready to PRINT something.
- IF variable B exists get its value and PRINT it ELSE branch to the "No such variable" message.

Once Basic has decided to branch to an error message, it gives up and lets the 6502 microprocessor chip and operating system deal with things.

Error messages follow a standard format, which is, first a BRK instruction, then a byte containing the number of the error message – as

TO ERR IS HUMAN – BUT LET YOUR MICRO HANDLE THE SITUATION

**CHRIS BOWERMAN develops the technique
of custom made error handling routines**

returned by ERR – then as many bytes as needed for the text of the error message followed by a byte containing zero to show that it is the last character in the error message.

The text of the error message is made up of bytes containing the Ascii value of the characters of the message – as Figure 1 shows.

When the 6502 chip, the brains of the BBC Micro, starts to execute the error message, the first instruction it encounters is the BRK instruction.

Whenever the 6502 chip executes a BRK it jumps indirectly to &FFFE [same in Basic II]. That is, it branches to the location whose address is stored in locations &FFFE and &FFFF. In English this means that the micro always branches to location &DCIC [&DCIC] when it meets a BRK instruction and it then starts executing the code from there.

Having got to &DCIC [&DCIC] it sets up zero page locations &FD and &FE to point to the error message number used by both REPORT and

ERR and then does an indirect jump – yes another – to &202, the so-called BRK vector.

The computer will thus jump to the location whose value is stored at locations &202 and &203 which is &B433 [&B402].

Note that as locations &202 and &203 are in RAM we may alter their contents so that they point to our own error handler – this is what we will do in the utility.

Thus to summarise, the computer has set up the variable ERR, set up the text which REPORT will print, and has branched to the computer's error handler.

Don't worry too much if you've only just kept with me – the really important bit follows.

All you need to know is that we're now about to execute the code of the error handler starting at location &B433 [&B402]. It's the only part of the error handler whose operation we can alter anyway.

Now back to the error handler at &B433 [&B402]. To help follow our discussion, you might want to disassemble the routine with Jim Notman's disassembler which appeared in the February, 1985, issue of *The Micro User*.

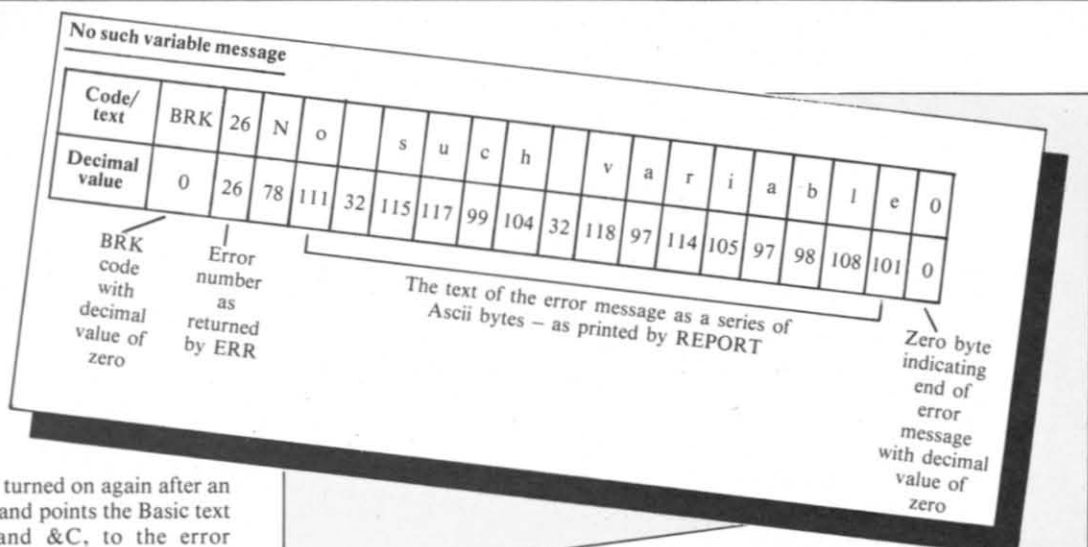
The handler first tests to see if the error occurred in the keyboard buffer and if it did sets ERL, stored at locations 8 and 9, to 0. There are no line numbers in the buffer and so it is only logical to set the ERL variable to zero.

Otherwise the computer calculates the line at which the error occurred and stores it at locations 8 and 9 – that is in the ERL variable.

The computer then turns line tracing

```
10 REM Program I
20 REM By Chris. Bowerman.
30 MODE7
40 PRINT "ERROR HANDLER address p
rinter"
50 IF (!&202 AND&FFFF)=&B433 THEN
PRINT "This machine has BASIC I" ELSE
IF (!&202 AND&FFFF)=&B402 THEN PRINT
This machine has BASIC II" ELSE CLS:P
RINTTAB(0,12)"HARD-RESET your machine
and re-RUN":END
60 PRINT
70 PRINT "BRKV at &202= &";~(!&202
AND&FFFF)
80 PRINT "Error vector handler at &
16,&17= &";~(!&16 AND&FFFF)
90 PRINT "BRK indirect jump at &FFF
E= &";~(!&FFFF AND&FFFF)
100 IF (?(!&202 AND&FFFF)+13) AND&
FFFF)=76 THEN PRINT "Error handler exe
cution address &";~(!&202 AND&FFFF
)+14) AND&FFFF)
110 PRINT "These are all the error
routines."
120 END
```

Program I



off - it must be turned on again after an error occurs - and points the Basic text pointer, &B and &C, to the error message pointer, &16 and &17. (The error message pointer usually contains &B443 [&B433].) The computer will then jump to location &8AB6 [&8BA3].

This routine makes the computer execute the Basic to which the text pointer is now pointing - that is &B443 [&B433]. The following Basic code is stored at &B443 [&B433]:

```
REPORT:IF ERL<>0 PRINT" at line
"ERL;
PRINT:END
```

This is very similar to the code we used last month to print out error messages in Basic. The machine always needs an error handler of some sort which must be written in Basic. What in fact happens when we supply our own error routine in Basic with the ON ERROR statement is that the error message pointer, &16 and &17, is changed from pointing to &B443 [&B433] to the Basic error handler in our program.

When the computer then jumps to &8AB6 [&8BA3] it begins to execute the Basic of our error handler following the ON ERROR statement. The ON ERROR statement thus changes the contents of the error message pointer, &16 and &17, to point to the Basic text immediately after the ON ERROR.

ON ERROR OFF, of course, changes the contents of the error pointer to the computer's own Basic routine at &B443 [&B433].

Whenever you ask the computer about the variable ERR, it will return the value of the error message number byte of the error message. ERR knows where this byte is because the machine has set locations &FD and &FE to point to it.

REPORT also uses this pointer to print the error message. It prints out the characters following the error number

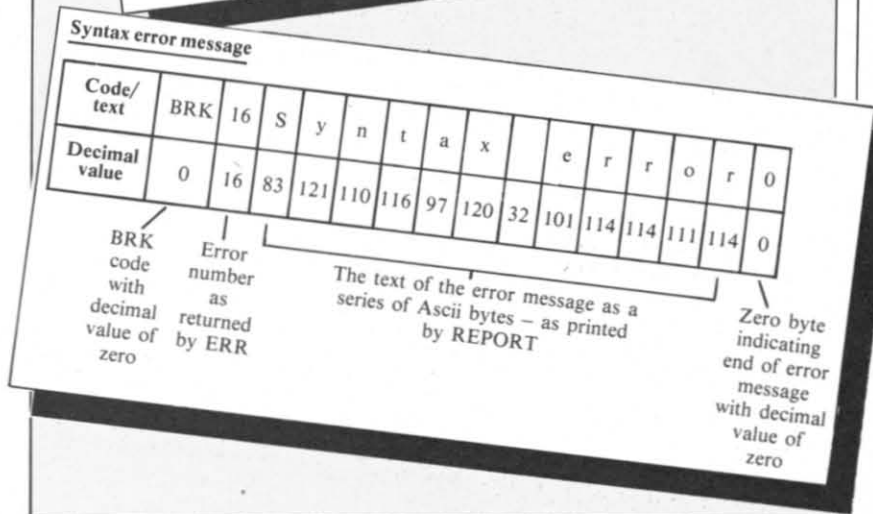
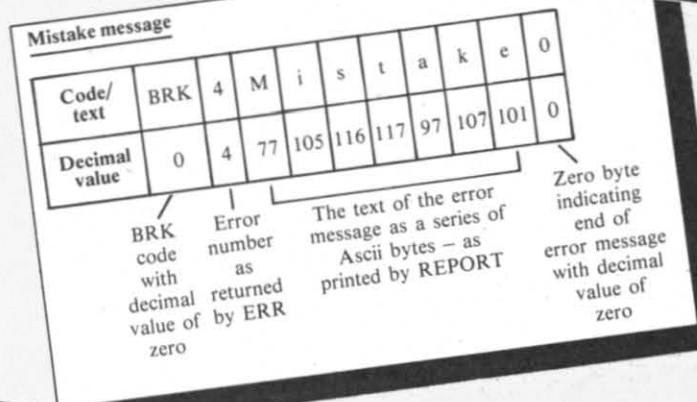


Figure 1: Error messages

byte until it reaches the terminating byte of value zero.

The variable ERL is worked out from where the Basic text pointer, &B and &C, stopped interpreting. It is easy for the computer to calculate the line number it was executing when the error occurred and the result is stored in &8 and &9 to be accessed by ERL.

Now we have an appreciation of the

mechanisms used for dealing with errors we can move on to the utility which alters the contents of &202 and &203, the BRK vector, to point to the utility.

When an error occurs it lists the line number at which an error occurred and highlights the error. Line 180 of the utility checks to see if there is a Basic


```

10 REM ERROR MESSAGE EXTENSION
15 REM Program II
20 REM By Chris. Bowerman.
30 CLS
40 org=&900
50 BASIC=FALSE
60 IF (!&202 AND&FFFF)=&B433 THEN
BASIC=1
70 IF (!&202 AND&FFFF)=&B402 THEN
BASIC=2
80 IF BASIC <> 1 AND BASIC <> 2 AND
D(!&202 AND&FFFF)=org THEN CLS:PRINT"
ERROR MESSAGE EXTENSION present." :END
90 IF BASIC <> 1 AND BASIC <> 2 TH
EN CLS:PRINT"PLEASE reset computer an
d re-RUN":END
100 IF BASIC=1 THEN deferrorv=&B433
:decout=&98F1:list=&B53A:detoken=&97B
6 ELSE deferrorv=&B402:decout=&991F:1
ist=&B50E:detoken=&97E7
110 BRKV=&202:OSWRCH=&FFEE:OSNEWL=&
FFE7
120 errormessg=&FD:page=&18:decoutv
ar=&2A:pointer=&B:handlvec=&16
130 errorpos=&72:linenum=&74:temp=&
77:savptr=&78
140 handler=! handlvec AND&FFFF
150 FORZ=0 TO1:PX=org:[OPTZ*2
160 .errorcheck LDApointer:STAsavpt
r:LDApointer+1:STAsavptr+1:LDApointer
-1:STAsavptr+2
170 LDY#0:LDA(errormessg),Y:CMPI17:
BEQsystem
180 .handlertest LDAhandlvec:CMPIha
ndler MOD256:BNEol:LDAhandlvec+1:CMPI
#handler DIV256:BNEol:JMPuser:.noj J
MPsystem
190 .user LDY#0:.loop0 INY:LDA(poi
nter),Y:CMPI32:BEQloop0
200 CLC:TYA:ADCpointer:STAerrorpos:
LDApointer+1:ADC#0:STAerrorpos+1:LDY#
0
210 LDApointer+1:CMPIpage:BMIsystem
220 JSRSGNEWL
230 .loop1 LDA(pointer),Y:CMPI13:BE
Qfoundline
240 SEC:LDApointer:SBC#1:STApoin
ter
250 LDApointer+1:SBC#0:STApoin
ter+1
260 JMPloop1
270 .foundline INY:LDA(pointer),Y:S
TAdecoutvar+1
280 INY:LDA(pointer),Y:STAdecoutvar
:JSRdecout
290 JSRlistline
300 JSRSGNEWL
310 .system LDAsavptr:STApoin
ter:LDAsavptr+1:STApoin
ter+1:LDAsavptr+2:ST
Apoin
ter-1:JMPdeferrorv
320 .listline LDY#4
330 .loop2 LDA(pointer),Y:CMPI13:BE
Qreturn
340 TYA:CLC:ADCpointer:CMPIerrorpos:
BNEnterror
350 LDApointer+1:CMPIerrorpos+1:BEQe
mphasise
360 .nterror LDA(pointer),Y:STYtem
p:JSRdetoken:BCCdecunch
370 JSRdecout:LDYtemp:INY:INY:INY:J
MPnext
380 .decunch LDYtemp:JSRlist
390 .next INY:JMPloop2
400 .return RTS
410 .emphasise LDA#62:JSRSGWRCH:JSR
OSWRCH:JSRSGWRCH
420 LDA(pointer),Y:STYtemp:JSRdetok
en:BCCuncunch
430 JSRdecout:LDYtemp:INY:INY:INY:J
MPrest
440 .uncunch LDYtemp:JSRlist
450 .rest LDA#60:JSRSGWRCH:JSRSGWR
CH:JSRSGWRCH
460 JMPnext
470 J:NEXT
480 !BRKV=org OR (!BRKV AND &FFFF00
00)
490 DIM M-1
500 $M="K.100,IM!&202="+STR$(org)+"
OR (!&202 A.&FFFF0000)IM"
510 XI=M:YI=M DIV256:CALL&FFF7
520 CLS:PRINT"Extended error hanlin
g enabled." :END

```

Program II

From Page 109

user-provided error handler by testing the contents of &16 and &17.

If there is one the utility will not print an error message. If there is no user-provided ON ERROR routine, or the routine has been disabled with ON ERROR OFF, the utility lists the line which caused the error and highlights the code it was last processing - that is, what caused the error pointed to by the text pointer at &B and &C. Deleting line 180 forces the utility to list the error line

whenever an error is detected.

The routine always finishes by executing the normal error handler which will report the error that occurred beneath the listed line.

By altering the variable *org* in line 40 the utility can be made to assemble anywhere in RAM.

To use the extended error handler type it in - Program II - as shown, omitting line 180 if desired, see above. If you are unsure as to the affect of line 180, omit it. Then type RUN.

The utility will now assemble and you

may get rid of the assembly language listing with NEW. You may now enter and RUN your own programs. When errors are detected the offending line will be listed with >>> <<< pointing to the error. The utility will survive Break but not a hard Break.

The second utility, Program III, is a Basic function which you may use in your own programs. It is used just like any normal function definition and will return in words - that is, as a string - the last error that occurred. It is often more convenient to test what error last occurred as a string than comparing ERR with an error number. For example:

```

IF FNerrormessg="Escape" THEN PRINT
"you hit ESCAPE !!!"

```

is easier to understand than:

```

IF ERR=17 THEN PRINT"you hit ESCAPE
!!!"

```

I have tried here to detail as explicitly as possible the mechanisms whereby Basic deals with programming errors. I hope that in the process I have not only provided a useful utility but clarified the methods of error trapping in Basic, and also supplied machine code programmers with sufficient knowledge to be able to write customised error handlers suited to their own needs.

```

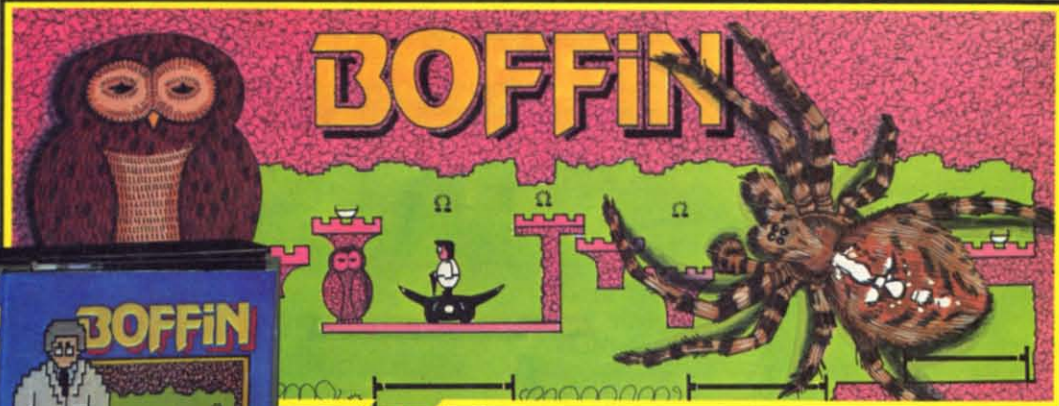
10 REM Program III - FNerrormessg de
finition and demonstration
20 REM By Chris. Bowerman.
30 REM Lines 170 to 230 are the de
finition of the function - the rest i
s a demonstration
40 CLS
50 ON ERROR GOTO130
60 REPEAT
70 INPUT"Type a number ",A
80 PRINT"This was the number ";A
90 INPUT"Type a string ",A$
100 PRINT"This was the string ";A$
110 UNTILFALSE
120 END
130 ON ERROR OFF
140 IF FNerrormessg="Escape" THEN PRI
NT"END of program":END
150 IF FNerrormessg="Too big" THEN PR
INT"your typed entry was too large":G
OTO50
160 REM >>>> FUNCTION DEFINITION <
<<<<
170 DEFNerrormessg
180 LOCAL M$,PX:M$=""
190 PX=!&FD AND&FFFF
200 REPEAT PX=PX+1
210 M$=M$+CHR$(?PX)
220 UNTILPX?1=0
230 =M$

```

Program III

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QUARTERS

By JERRY LANCASTER

QUARTERS is a micro-simulation of a well known table top board game. Played on a 9 x 9 grid using square tiles of dominoes, it demands both skill and strategy in order to achieve a high score.

The tiles are split into "quarters" across their diagonals, hence the name of the game. Each quarter is coloured randomly in one of four colours.

Ordinary dominoes, which use seven numbers - 0 to 6 inclusive - give 28 possibilities. With the new design we get 70 possibilities using only the numbers 1, 2, 3 and 4!

We can draw these dominoes on the screen, showing spots or ordinary numbers - but there is an alternative. Instead of *printing* the number on each quarter we could use the number to produce a colour by using it with Mode 2 in a GCOL 0 number statement. This would give us squares which can show up to four different colours. Figure 1 shows the idea.

The tile "in play" is displayed above the board and can be rotated about its centre using the R key while you decide the most valuable location to place it in.

When placing the tile, just as in ordinary dominoes when like numbers should match, so in Quarters the colours should match on meeting edges.

To select the tile's location you move

a flashing cursor around the grid with the arrow keys. Pressing P will place the tile at the selected location and you then score points.

You score every time you can place a tile on the board, scoring more points if you can match more than one coloured edge with a neighbouring tile or tiles. If it is impossible to play your tile you abandon your go using the Delete key.

There are 70 different coloured dominoes and the game is finished when all have been used.

In addition there are three different ways to play the game - a solo game of patience to achieve a high score, play against a human opponent or play against the computer. Whichever way you try it, Quarters is a game that will keep you entranced for hours.

PROGRAM STRUCTURE

First READ the dominoes into a random order.

Then DRAW a suitable grid on the screen so that the playing area is limited.

Then REPEAT:

Display one domino at the side of the playing area.

Allow the player:

- To move a marker around the grid. The final position of the marker will show where the domino is to be played.
- To turn the displayed domino so that it can match the dominoes it will touch when it is

played.

- To commit the domino to being played at the marker position on the grid.

Check the legality of playing that particular domino in that particular position - do the touching colours match or clash?

If legal, wipe out the domino on display and print it at the selected position. Calculate the score and update the displayed totals.

If not legal just wipe out the old domino and continue.

UNTIL all 70 dominoes have been played.

```
110 REM::Q U A R T E R S (4)
120 REM::Program by J G Lancaster
130 REM::(C) THE Micro User
140 MODE2
150 VDU23,1,0;0;0;0;
160 *FX9,10
170 PROCtitles
180 PROCinit
190 REPEAT
200 PROCchoice
210 PROClayout
220 PROCaction
230 PROCendgame
240 PROCempty
```

```
250 UNTIL FALSE
260 END
270 DEFPROCgrid(X,Y,step)
280 A=X
290 B=Y
300 length=9*step
310 CLS
320 REPEAT
330 MOVE A,Y
340 DRAW A,Y+length
350 MOVE X,B
360 DRAW X+length,B
370 A=A+step
380 B=B+step
```

```
390 UNTIL A>X+length
400 ENDPROC
410 DEFPROCframe(Xpos,Ypos,vert,hor)
420 MOVEXpos,Ypos
430 DRAWXpos,Ypos+vert
440 DRAWXpos+hor,Ypos+vert
450 DRAWXpos+hor,Ypos
460 DRAWXpos,Ypos
470 ENDPROC
480 DEFPROCdomino(XX,YY,N1,N2,N3,N4)
490 PROCtriangle(N1,-a,-a,-a,+a)
500 PROCtriangle(N2,-a,+a,+a,+a)
```

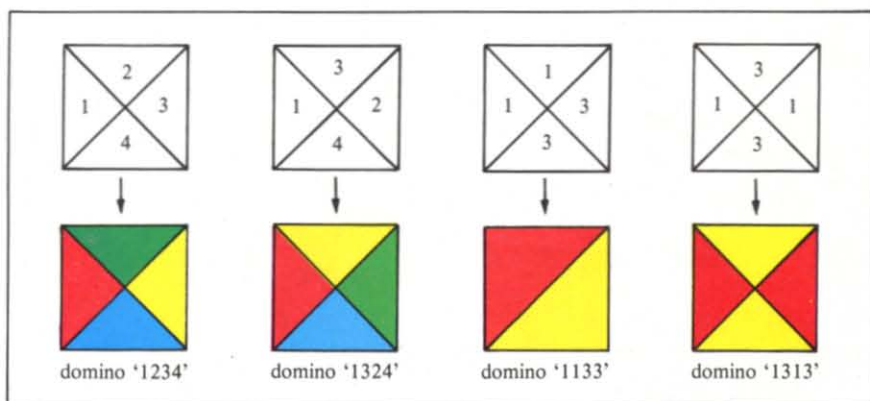


Figure 1

VARIABLES

a Fixes size of domino.
aa,bb Used to fix marker position.
colour Domino colour control.
compX, compY Computer's X and Y coordinates.
d Checks legal play.
displayX(1), displayY(1) Display dominoes available for play.
displayX(2), displayY(2) Game score for each player.
gamescore(1), gamescore(2) High score.
Hiscore Moves marker around the grid.
xmove, ymove
print Record when the computer plays.
P
pp,qq Identifies whose turn it is to play.
player
score(1), score(2) Holds the scores of each player.
totalscore(1), totalscore(2) Holds total points for several games.
xspot, yspot Control marker position.
oldxspot, oldyspot

PROCEDURES

grid() Draws playing grid.
frame() Draws display and scoring areas.
domino() Draws four triangles to make up the domino.
triangle()
init Sets up initial values.
separate(N%) Finds value of colours for each domino.
rotation(N%) Rotates each domino.
action Groups necessary PROCs together for the game play.
move Moves spot around grid.
spot() Draws spot.
check If legal, works out score-used in PROCTotal (player).
checksum Checks legality of play.
dominoIN(player) Used when domino is played.
dominoOUT(player)
sound() Selects suitable sounds.
shuffle Puts dominoes into a random order.
empty Wipes out previous random order.
key(player) Checks which key has been pressed.
computer Lets the computer play.
limits Keeps play inside the grid.

```
510 PROCtriangle(N3,+a,+a,+a,-a)
520 PROCtriangle(N4,+a,-a,-a,-a)
530 ENDPROC
540 DEFPROCtriangle(colour,p,q,r,s)
550 GCOLOR,colour
560 MOVE XX,YY
570 MOVE XX+p,YY+q
580 PLOT85,XX+r,YY+s
590 ENDPROC
600 DEFPROCinit
610 ENVELOPE2,1,5,0,0,25,0,0,126,0,
0,-126,126,126
620 J=70:REM total number of domino
```

```
630 DIMscore(2)
640 DIMgamescore(2)
650 DIMtotalscore(2)
660 DIMdisplayX(2)
670 DIMdisplayY(2)
680 DIMdominoX(J)
690 a=45:REM half width of domino
700 aa=0:bb=0
710 colour=0
720 compX=165:compY=145
730 d=12
740 displayX(1)=64:displayY(1)=800
750 displayX(2)=1136:displayY(2)=800
```

```
760 gamescore(1)=0
770 gamescore(2)=0
780 Hiscore=160
790 xmove=0
800 ymove=0
810 print=0
820 P=0
830 pp=0
840 qq=0
850 player=1
860 score(1)=0:score(2)=0
870 score=0
```

Turn to Page 146



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THE "tuning meter" of the BBC teletext adapter is a good method of ensuring that the adapter is correctly tuned to the channel required, but I have just discovered that for BBC1 only, my tuning meter is out of alignment somehow.

I have had problems with "Bad Data" messages since new - 14 months ago - but had relied on the tuning meter showing me when I was at maximum signal strength reception, and which, for BBC2 and ITV1, is as required. I cannot yet receive Channel 4.

Using *HON (header only on) and *HOFF (header off), I found that if I retuned BBC1 to give me a flicker-free header, I now get perfect reception of BBC1, but the tuning meter tells me that I'm not even receiving teletext!

Is there some way I can adjust the decoder to tell the computer that I am, indeed, at maximum signal strength?

I have in the past taken the decoder back to the local BBC agents re the "Bad Data" messages, but there are two problems here:

- They are on a different transmitter.
- They aren't using my computer.

Thus they could not find anything wrong with the decoder.

Could the fact that I broke a leg on my original TFS eprom and had to buy another have any influence on the above problem?

For completeness, I have a

Reflections on teletext

BBC Model B, OS 1.2, with an ATPL Sideways board fitted with Basic II, 0.9 DFS, 1.0 TFS, Wordwise-Plus, Disc Doctor, Graphics Ext., Printmaster and Sleuth, fitted in descending order of priority.

The decoder has its own dedicated high gain aerial, no joins in the aerial lead, and the centre pin of the aerial plug is soldered, to ensure maximum strength.

Many thanks for your help, and congratulations on a fine magazine. — *W.K. Tranter, Warwick.*

● Reception of teletext can be difficult in a strong signal area, due to reflected signals. On vision you would notice this as ghosting.

Even a picture apparently free from ghosting can give poor reception due to reflections.

It is the nature of reflections to change with frequency — that is why it only affects one channel.

Your solution has been to mistune the signal so that it is severely attenuated. This reduces the reflections to such a point as to not cause you so much trouble.

If you really want a cure, then get your aerial adjusted. High gain types have many side lobes

which can pick up reflections.

An aerial with a good front to back ratio is called a Log periodic. You could try one of these. A TV engineer should be able to test for these reflections for you.

VIA not guilty

HELP! My GS22 MOS VIA keeps blowing up.

This manifests itself first as a partial and then a complete inability to control the TV output, finally resulting in complete loss of picture.

I've had to replace two VIAs with this problem. I have an old issue 3 board, with Viglen DFS.

A friend has suggested that these old machines may have faulty power supplies, and I have noticed that after several hours' use the chips are running quite hot.

Do you think that one or other or both of these might be causing the problem? Or would I be better off with a monitor? — *Steven J. McClure, Oxford.*

● This is quite puzzling as the

VIA does not control the screen at all.

There are two VIAs. One is used for the printer port and user port and the other is used to look after the keyboard, sound chip and real time clocks.

Therefore I cannot understand why replacing it has any effect on the screen.

I suspect that there is another faulty chip or your UHF modulator is going off tune.

All computers run hot. As a rule of thumb, if you can't stand to keep your thumb on a chip, it is too hot, otherwise it's OK.

If the problem persists, take it in to a service centre and have it looked at. But don't go on replacing the VIAs — they're nothing to do with it.

Flashing monitor

I GOT my BBC with the first issue of *The Micro User* and wouldn't be without either. I also got an excellent Phoenix green monitor — a combination I have found very good indeed.

I didn't realise at the time how important colour was, however, and decided later to use a secondary TV for games.

The colour TV periodically "flashed and scrolled" until it completely blew up. I had it repaired and it did the same again two or three times.

I asked if it could be the computer and was always told that a computer cannot harm the TV.

I then bought a new TV — and the same happened.

I then tried a new RGB TV monitor and, using the RGB socket, had the same "flashing and scrolling", so returned it.

The suppliers, however, could not find any fault as it worked OK away from the computer, as did the others.

The Phoenix uses the proper mono monitor socket. I use the proper TV socket for the TV and the RGB socket for the colour TV/monitor.

The Phoenix is always in use

Loose screw, or loopy micro

I HAVE in my BBC a toolkit from Beebug and a UDM DDFS which was supplied to me by Microware. The 80-track 200k single-sided disc drive is made by Shugart, model SA 410, and sold to me by Midwich.

The same day that the interface was installed, the keyboard played up. The Return key acted as the delete key and the "S" turned into "A". Microware solved the problem for me over the telephone.

Later, my computer kept going into Mode 3 and pressing Break. So I did a hard reset.

Instead of 32k, it told me that I have only 16k. To verify this, I typed *FREE and it told me that I had 8k of total memory.

Pressing Break and *FREE told me that I have 72.75K.

Later, the computer wiped out a disc when I typed *CAT and a similar thing happened about the memory but reported with 52k.

Yesterday, when typing, the computer did everything as normal until it decided to retype everything in the past five minutes.

Another thing it does is to wait until a line is almost

complete. Then it multiplies that line by three.

Deleting this line is a problem where deleting the first few characters, then it deletes the whole line.

Is it me, the computer, the disc interface or the disc drive? — *Matthew C. Field (aged 15), Kingston-upon-Thames.*

● Simple, it's the computer. Get it seen to by a psychiatrist or failing that a service centre.

It could be just about anything, but it sounds like something loose like a screw!

From Page 119

with the other(s) and never varies.

While no-one will admit that the computer can be at fault, the evidence must be more than coincidental.

Can you help, please, as colour is indeed almost a necessity and it looks like I might otherwise take quite a while to find a colour unit which will work. — *Bill Towse, Falmouth.*

● The clue to what is going on here lies in what was repaired in your TV sets.

Flashing could be caused by loose wiring or a chip with a leg bent over underneath it. This could cause temporary loss of sync pulses that can cause the EHT generator in the TV set to switch on and off.

This could overstress and cause damage.

The only way to test this is to look at the video signal with an oscilloscope.

As the fault occurs on TV and monitor, I suspect that the computer is the culprit.

Filling 8in drive

I HAVE one of the first BBC As which has been uprated to B OS1.2. Working on a limited budget, I have just been offered very cheaply a disc drive, but I have no real knowledge of these. Can you help?

The drive is a dual 8" that has been used with a Tuscan micro supplied by Transom Components.

I know I need to have a disc interface installed in my computer, but are there any problems with the compatibility and the fact that it is 8"?

I appreciate that available software on disc will not be of any use to me, but then most of my programs are long, my own and written in Basic.

Am I right in assuming that if the system can be set-up that I would then use the set-up just as I use my cassette system at present?

Is it possible to let me know what limitations there would be on such a set-up? — *David Mather, Crawley, Sussex.*

● You can fit an 8 inch drive to the BBC, but you need a

different DFS chip and there are also some modifications to the tracks on the computer's PCB. This information can be obtained from Vogan Products, The White House, 21 Grove Road, Hazlemere, Bucks HP15 7QY.

The instructions they give are not for the complete beginner, but are sufficient to do the job if you are competent.

The system would work just like a cassette system, but file names are restricted to seven characters.

Light pen resistor

I WAS persuaded recently by my eldest son to construct the light pen detailed in your excellent article in the October, 1983, magazine.

Much to my surprise, it worked first time on Bellringer. On the other programs it failed to work even though the monitor brightness was set at maximum.

I then noticed that the value of R1 is quoted as 690 ohms on page 67 while on page 69 it is valued at 680k ohms in Figure V and 680 ohms in the list of components.

Since I have not seen any corrections in subsequent editions of *The Micro User*, could you please tell me which value is correct and if changes to the sensitivity are made by altering this resistor (or any other component)?

Although the light pen works, I am a little disappointed to see that it will not work on other commercially available software.

If you could advise me on this and also let me know if it is

possible to build a microswitch into the circuit I should be most grateful. — *David F. Graham, Maidenhead.*

● The value for R1 should be 680R. However it is not very critical and is included as I notice that it slightly increased the rise time from the sensor.

Your problem with other programs might be that the set is too bright.

As you know, the light pen uses a pulse detector circuit to see when it is pointing at the screen.

You can nullify the effect of this by removing the appropriate lines in the software. See the program description to identify them.

As to fitting a microswitch, it is perfectly possible, but first you have to know what you want it to do.

Different light pens do different things to the analogue input channels to indicate you are pointing to a valid spot.

Without knowing what the software wants, it is hard to give you a circuit.

Speech chips

REGARDING the article on speech chips (*Micro User, March*) Texas can also offer 71003 talking clock and 81001 Teecomm VS chips. The latter could be used as part of an auto telephone/modem system.

I believe Texas also plans to make others available.

I have also seen someone offering to create the data from users' own tapes (I believe they used the Texas Speechlab). — *Michael Mallett, Reading.*

● The 71003 and 81001 cannot

be used with the Acorn speech system as they are not serial devices but ordinary eeproms. The production of a serial ROM is quite costly and I would be surprised at any one being able to offer custom ones.

Most probably the service is for eeproms like the above two chips. These are used by the Texas TMS5100A and not the TMS5220 as used in the BBC computer.

By the way, when I enquired about the portable speech lab I was told it cost £8,000.

Split output

I HOPE I can help Paul Hollyer (Problem Page, March) regarding split output. You can easily separate the text and graphics if you program a different colour out of the three TV colours red, green and blue for text and graphics.

Then you need only adjust the individual colour sensitivities of your two TV monitors to see only your text on one monitor and the graphics on the other.

Alternatively, since the sync signal on the RGB connector SK3 is separate, then you can disconnect any one of the colours from the input of each of your two monitors, and select part of the picture for display, and interchange the colours to give, for example, two red screens even with the text and graphics separately programmed in say green and blue. — *R.T. Poet, Wolverhampton.*

● Yes a good bit of lateral thinking, I would take my hat off to you if I wore one! However they are not independent screens are they?

Advantages of the 65C02

THE two chips 6502A CPU/65C02A CPU are being offered for sale in various magazines.

As the BBC Micro has the 6502A fitted but the second processor has the enhanced version, 65C02, is there any advantage in replacing the 6502A in the BBC with the enhanced version (at £9.50 it isn't very expensive)?

And would EVERYTHING still work, software and hard-

ware-wise? — *I.S. Crawford, Banbury.*

● The only advantage in the 65C02 is the extra instructions it contains for machine code programmers. There is also some suggestion that these are better at driving a heavily-loaded bus.

If you put "everything" in capitals, then the answer is no.

This is because in the old version there are some undocumented machine code instruc-

tions that do not produce the same results in the new.

However, only an idiot would use these codes in a commercial product, I wonder how many of them have?

You can be sure that everything that is of any use should work, but then why bother? If you are going to use these extra instructions you are only making your programs incompatible with most other machines.

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A handy utility by WILLIAM LEWIS to help debug Basic programs

Keep track of your variables

VARIABLE Lister is an extremely useful utility program which lists all the variables which have been used in a Basic program.

There are in fact seven different types of variable used on the BBC Micro. These are the resident integer variables (@% to Z%), the normal integer variables, floating point variables, and strings. There are also arrays of each of the last three types. Let us see how each of these are stored in memory.

The resident integer variables occupy the area from &400 to &46B, each of them requiring four bytes. They are stored least significant byte (LSB) first and most significant byte (MSB) last — see Figure 1.

All other variables are stored just above the Basic program. They are pointed to by a table running from &480 to &4F5 — see Figure 2. This table points to the first variable beginning with that letter. For example, locations &480, LSB, and &481, MSB, point to the first variable whose first letter is @. If there are none, then both locations contain 0.

This table points first of all to two bytes which give the location of the next variable beginning with that same letter. If there are no more, then again both contain 0.

Following this come the remaining letters of the variable name including the \$, % or (if there is one. This is terminated by a zero byte.

For integers and floating point numbers which are not arrays, the actual number follows on from here, five bytes for floating point and four bytes for integers.

For strings the next two bytes point to the address in memory of the string. The next byte is the maximum length of the string and is followed by its current length.

With arrays the number directly after the zero byte is the number of dimensions * 2 + 1. This is followed by the number of elements in each dimension in two bytes LSB followed by MSB. Following this there are the actual numbers, four bytes for integers, five bytes for floating point numbers.

String arrays are slightly different. Each string has a separate pointer, maximum length and current length. If the string has not been defined then all

four contain zero bytes.

Note that variables set up to reserve space for machine code programs, for example DIM mc% 100, are treated as normal variables and are given the value of the first location that they reserve.

My program can handle all these variables although arrays are limited to 16 dimensions. It uses a number of the Basic ROM routines to print out the variables. The main one is *convasc*. This converts both floating point numbers and integers into an Ascii string in the string working area SWA &600, the length of which is stored at location &36.

For integers the number must be in the integer working area, IWA &2A-&2D, and the Y register must contain &40. For floating point

numbers the numbers must be stored in floating point working area A, FWA &2E-&35, and the Y register must contain &FF.

But notice that the FWA is eight bytes long whereas our variable is only five bytes long. This is because the five bytes are a packed format of the eight bytes. Fortunately the Basic ROM provides a routine to unpack a five byte floating point number, so this is used.

Location &15 must also be set up as required. If it contains &FF then the number will be converted to hexadecimal. If it is 0, then it will be converted to decimal. This, as you will see, is implemented in my program.

The program itself uses three pages of

@%	&400	-&403	I%	&424	-&427	R%	&448	-&44B
A%	&404	-&407	J%	&428	-&42B	S%	&44C	-&44F
B%	&408	-&40B	K%	&42C	-&42F	T%	&450	-&453
C%	&40C	-&40F	L%	&430	-&433	U%	&454	-&457
D%	&410	-&413	M%	&434	-&437	V%	&458	-&45B
E%	&414	-&417	N%	&438	-&43B	W%	&45C	-&45F
F%	&418	-&41B	O%	&43C	-&43F	X%	&460	-&463
G%	&41C	-&41F	P%	&440	-&443	Y%	&464	-&467
H%	&420	-&423	Q%	&444	-&447	Z%	&468	-&46B

Figure 1: Resident integer variables

&480	-&481	= @	&4A8	-&4A9	= T	&4D0	-&4D1	= h
&482	-&483	= A	&4AA	-&4AB	= U	&4D2	-&4D3	= i
&4A4	-&4A5	= B	&4AC	-&4AD	= V	&4D4	-&4D5	= j
&486	-&487	= C	&4AE	-&4AF	= W	&4D6	-&4D7	= k
&488	-&489	= D	&4B0	-&4B1	= X	&4D8	-&4D9	= l
&48A	-&48B	= E	&4B2	-&4B3	= Y	&4DA	-&4DB	= m
&48C	-&48D	= F	&4B4	-&4B5	= Z	&4DC	-&4DD	= n
&48E	-&48F	= G	&4B6	-&4B7	= [	&4DE	-&4DF	= o
&490	-&491	= H	&4B8	-&4B9	= \	&4E0	-&4E1	= p
&492	-&493	= I	&4BA	-&4BB	=]	&4E2	-&4E3	= q
&494	-&495	= J	&4BC	-&4BD	= ^	&4E4	-&4E5	= r
&496	-&497	= K	&4BE	-&4BF	= _	&4E6	-&4E7	= s
&498	-&499	= L	&4C0	-&4C1	= `	&4E8	-&4E9	= t
&49A	-&49B	= M	&4C2	-&4C3	= a	&4EA	-&4EB	= u
&49C	-&49D	= N	&4C4	-&4C5	= b	&4EC	-&4ED	= v
&49E	-&49F	= O	&4C6	-&4C7	= c	&4EE	-&4EF	= w
&4A0	-&4A1	= P	&4C8	-&4C9	= d	&4F0	-&4F1	= x
&4A2	-&4A3	= Q	&4CA	-&4CB	= e	&4F2	-&4F3	= y
&4A4	-&4A5	= R	&4CC	-&4CF	= f	&4F4	-&4F5	= z
&4A6	-&4A7	= S	&4CE	-&4CF	= g			

Figure 2: Variable pointer table

From Page 123

memory & 900-&BFD. These are the cassette and the function key buffers. This should be all right for most applications, but if it is not convenient then change start in line 270 and delete line 4140. This must be done after the program has been debugged because the final checksum routine will not work otherwise.

The utility makes use of the *CODE x,y command. This indirection through the user vector (&200-&201) with the accumulator holding 0 and the X and Y registers holding the parameters following the *CODE.

*CODE on its own will print out all the variables. *CODE 1 will print out all integers, including resident ones. *CODE 2 will print out all floating point variables and *CODE 3 will print out all strings. The number is automatically reduced to between 0 and 3 so that *CODE 5 is the same as *CODE 1. The number following this can either be 0 or 1. 0 means that integers and floating point numbers will be printed in decimal and 1 means that they will be printed in hexadecimal - see Figure III.

*CODE = *CODE0 = *CODE0,0

*CODE 1 = *CODE 1,0

*CODE 1,1

*CODE 2 = *CODE 2,0

*CODE 2,1

*CODE 3 = *CODE 3,0 = *CODE 3,1

Print all variables with floating point and integers in decimal.
Print all integers in decimal.
Print all integer in hexadecimal.
Print all floating point numbers in decimal.
Print all floating point numbers in hexadecimal.
Print all strings.

Figure III: Parameters sent with *CODE x,y

The program also uses six error checking routines. The first five check that P% (the location counter) contains the correct value. This helps you to locate missing mnemonics or added ones. The final one checks the total of all the bytes added together. Only if all of these are correct is the program correct.

Obviously check first of all that you have typed in the checking routine correctly. When you have typed it in correctly, RUN the program and the computer will prompt you to save the object code. It is also advisable to save the source code as well (SAVE "VARLIST").

The checksum in line 4140 should be changed to 79164 if you have Basic I. Other alterations for Basic I are given in the REM statements.

Once saved it can be reloaded using *VARS (or *RUN VARS on cassette) and then executed using *CODE x,y. This can be done directly or from a Basic Program.

And that's all there is to it. You'll find it's a great aid to debugging Basic programs.

**Listing starts
on Page 136**

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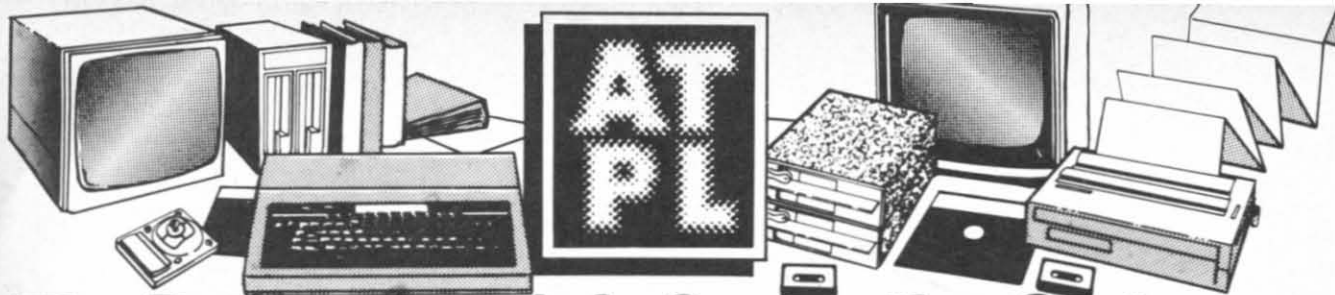
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LAST month we looked at how to beef up the BBC Micro's sound by adding a reverb unit to the sound output. As promised, here is something to add a little extra whoosh into your sound.

The timbre or colour of a sound depends upon its harmonic content. As we saw with the waveform generator – Body Building, October and November, 1984 – the more harmonics are added the more complex the waveform becomes. Now most real sounds vary their harmonic content over time, which means that to re-create them we need to mimic this behaviour. The sound output of the BBC computer is a simple square wave.

There is a lot of software executed in the computer to create amplitude and pitch variations in time. These are controlled by the envelope commands.

However, the harmonic content of the tone is constant in time and this produces only a limited number of sounds.

To vary the harmonic content, most music synthesisers utilise a lowpass filter whose cut-off frequency can be varied. The audio signal is passed through the lowpass filter and the higher harmonics are removed.

If the cut-off frequency is changed, then the harmonic content of the tone changes.

You can guess from all this and the title that this month we are going to add a variable lowpass filter. As this is quite a simple circuit, I have incorporated it on to the reverb board described last month.

There are many ways to make a variable filter. The method used in most synthesisers involves a transconductance amplifier. As the gain of this amplifier can be controlled by a voltage, it is possible to construct a voltage controlled filter.

This fits in nicely with music synthesisers, as most of the other components are also voltage controlled.

However, were we to adopt this approach we would need a digital to analogue converter, which would greatly add to the cost. Fortunately there is a better and cheaper way.

We have used filters many times in past projects, and a full explanation was given of how they work. However, just to recap, they are amplifiers with feed-back components that are frequency sensitive. That is, they feed back more of one frequency than another. Thus some frequencies get amplified and some do not.

The basic elements controlling this frequency-dependent action are a resistor and capacitor. The exact behaviour is dependent on the product of the resistance and capacitance, or $R \cdot C$. This is known as the time constant.

Whoosh it up with a sweeping filter

says MIKE COOK

Just to digress, it is interesting that the units of resistance, when multiplied by the units of capacitance, give units of time. Try to work it out from first principles if you don't believe me.

In order to construct a filter, several R/C pairs must be combined with high tolerance time constants. This calls for accurate values of resistor and capacitor, although what is really important is their product.

It is not possible to make accurate resistors in an integrated circuit for reasons most manufacturers wish they knew. Basically the problem is getting a uniform oxide covering and even when you have this the resistors vary a lot with temperature.

An alternative approach to making a resistor is to use a switched capacitor. Consider Figure 1a where capacitor C_s

is switched between an input and an output.

When over at the input it charges up to an amount determined by the input voltage. When it is switched to the output it deposits that charge into the output side of the circuit.

It is like dipping a bucket in water and throwing it on to a fire – the more often you dip and throw, the more water gets transferred to the fire.

In just the same way, the more often the capacitor is switched between input and output, the more charge gets transferred.

As charge flowing is current, then the current flow is dependent upon the switch rate.

With a resistor, the current flow is

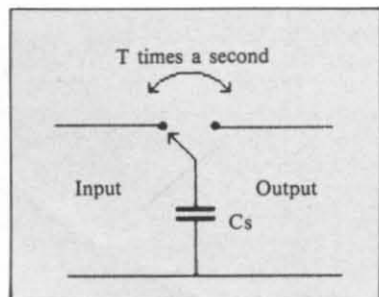


Figure 1a

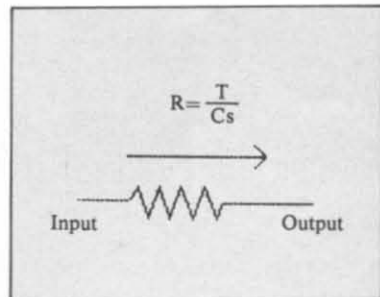


Figure 1b

From Page 127

dependent upon its value, so here you have a way of simulating a resistor with a capacitor as shown in Figure 1b.

Well, can we make accurate capacitors in integrated circuits? Alas, no. So are we any nearer? Well, yes, because the absolute value of the capacitor is not important when we are using a switched capacitor to simulate a resistor.

The Time Constant is given by $R \cdot C$ but, as the value of our simulated resistor is $R = T/C_s$ where C_s is the switched capacitor value, we can construct a Time Constant = TC/C_s . You see, the value of the time constant depends not upon the absolute values of the capacitors but on their relative value or ratio.

Fortunately the ratio of capacitor value is something which can be accurately controlled in the manufacture of an integrated circuit. Hence it is possible to construct a filter using a switched capacitor, or rather many switched capacitors where the cut-off frequency is proportional to the speed of capacitor switching.

The action of a switched capacitor is to sample a signal at discrete time intervals. For this to work, the sampling has to be done many times faster than one complete cycle of the signal, as explained last month.

The situation differs slightly, however, in that we are transferring pulses of the signal as shown in Figure 11. Nyquist and Shannon did a lot of work on this, but in non-mathematical terms if you take the pulses fast enough in relation to the rate of change of the signal it doesn't matter.

There are a few switched capacitor filter modules on the market. The one I have chosen for this project is the NF6CN-50 from National Semiconductors.

As well as containing a 6th order Butterworth lowpass filter, it contains the clock generator and two independent operational amplifiers — op amps — for signal processing.

The block diagram is shown in Figure 111. It can operate in various modes and even has a built-in oscillator circuit for stand alone applications, although in this project we won't be using that function.

Just a word of explanation about the type of filter.

The "order" of a filter is how quickly it attenuates signals which are past the cut-off frequency.

This is expressed in decibels (dB) per octave. Three dBs are equivalent to halving the amount of sound and a

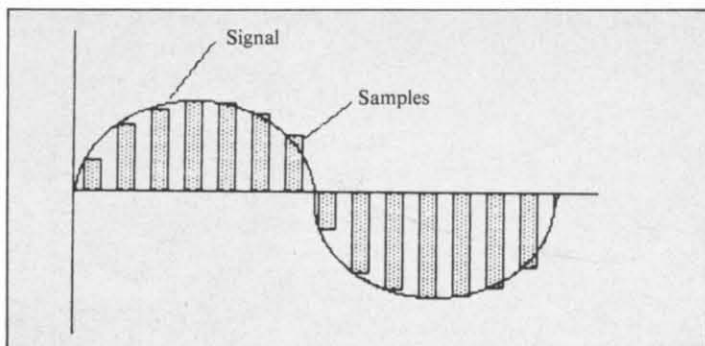


Figure 11: Sampled signal

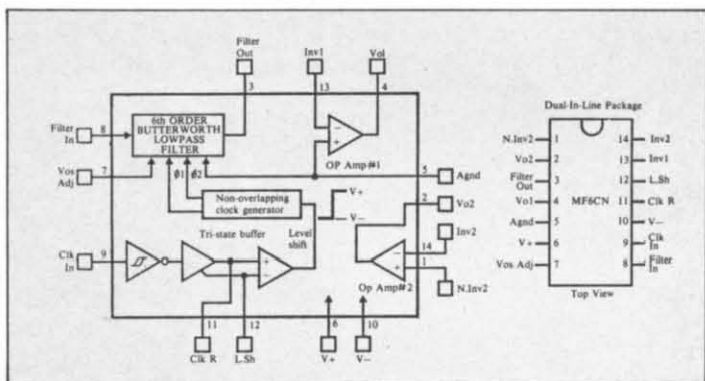


Figure 111: Block and Connection Diagrams

single order filter cuts off at 3 dBs/octave.

An octave represents a doubling of frequency. Therefore a 6th order filter cuts off at 18 dBs/octave.

The name Butterworth refers to the shape of the filter. This type makes a smooth transition between the signals it lets through and those it doesn't. We say it has no "ripple" or a nominally flat transfer characteristic.

There are many other shapes of filter such as Chebyshev, Cauer and Bessel, which have steeper cut-off rates but also have variations in the pass and stop bands.

So how can we control this filter? As I said, it needs a switching frequency to be sent to it. In the MF6CN-50 this frequency is 50 times the cut-off frequency. Guess what frequency ratio the MF6CN-100 has . . .

This means if we input a frequency of 50 kHz we will get a cut-off frequency of 1 kHz.

Well, the VIA has a timer in it that can produce a fixed frequency signal without any software intervention. Whenever it times out bit 7 of the user port can be made to toggle. This can be fed into the lowpass filter to control its cut-off frequency. To change the output of this timer it is necessary to poke a single value into the VIA.

Armed with the theory, we can look

at the circuit in Figure 1V. The Filter works off the same 12-volt supply as the reverberation board last month and needs an artificial signal earth provided by R24 and 25. As this circuit is on the same board as last month's the component numbering starts where we left off.

The clock signal from bit 7 of the user port is fed into a transistor to convert it into the 12-volt swing pulses needed to drive the filter.

C13 acts to increase the drive to the transistor at high frequencies and make it operate properly. The audio is fed into the filter via one of the internal op amps and the output is buffered by the other.

Some of the output signal can be fed back to the input by using VR3. This introduces a peak in the filter response at the cut-off frequency and this can be used for special effects to enhance certain harmonics.

There are two audio inputs labelled high (H) and low (L). The H input is for high-level audio input such as that taken from the speaker output, whereas the L input is for the low-level input found at PL16 again, described last month.

The filter's inputs and output are brought to separate connections so that it can be patched in before, after or instead of the reverberation unit.

The unit is powered from 12 volts which can be taken from a battery or the

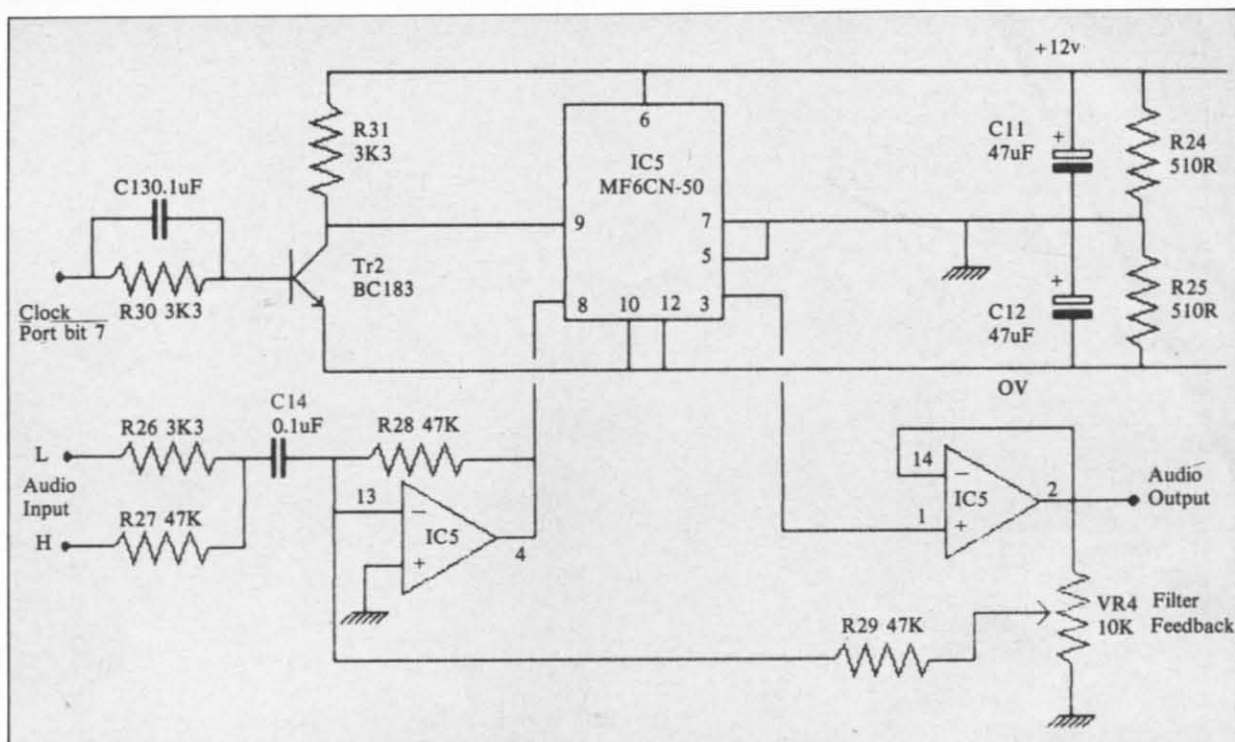


Figure IV: The controllable lowpass filter

Aux power socket on the computer. Figure V shows the pinout of the power socket.

All the components for this circuit along with last month's circuit including a printed circuit board can be obtained as Body Build Pack No. 26—order form on Page 176. The pack includes connecting wire with ready-cripped sockets to plug straight to the speaker connectors and a similar two-pronged plug for connection to PL 16 to get at the low-level audio.

As the filter needs to be connected to the user port you can use Pack 1—Transistion Board—and Pack 2—Ribbon Cable—to make the connection.

However, a cheaper way would be to just use a length of ribbon cable with one socket and tease out bit 7. If you do this, make sure you put a pull-up resistor between bit 7 and +5V. The value is not critical, anything between 3k and 50k will be all right.

Construction should present no difficulty and there are two sheets of general constructional advice included with each Pack 26.

Now for the software to make it go. Turn your attention to Listing I. This shows a simple tremelo program and illustrates the basis of the operation.

Before we look at it in detail, note that only two lines need to be entered to make the filter work. These are: line 350 to enable bit 7 on the user port to act as an output, and line 370 to start the

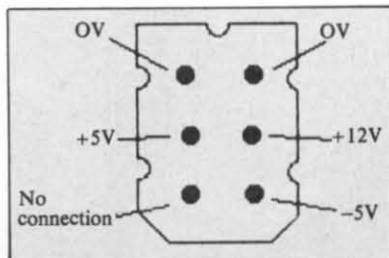


Figure V: Auxiliary power socket

output at the maximum frequency.

Once it is going, a poke to address &FE66 will change the frequency. This can be incorporated in your own programs in Basic or machine code.

But back to Listing I. This produces a tremelo effect by switching the filter between letting everything through and letting nothing through. The rate of switching can be controlled in 10 mS increments from the value in memory location &71.

The program intercepts the interrupt service routine at the first vector before it has done anything much. It then tests to see if it is a 10 mS timer interrupt—lines 90-120—and if it is then it counts how many times this has happened by decrementing memory location &70.

When this times out the value currently controlling the output frequency is exclusive Ored with the contents of memory location &72. This should contain 1, 3, 7, 15 or 31 as these numbers will toggle between the

maximum frequency and a limit.

Line 420 calls a routine which replaces the vectors with the start of our routine. Finally, two function keys are programmed so that the speed and depth of the tremelo can easily be altered.

The program is a background task and so now any music program may be run and the result heard. It sounds like the signal is rapidly being switched on and off, which in fact it is.

A more interesting effect can be produced from Listing II. This produces a ramp up and down of the filter cut-off frequency. It is basically the same as the first program only it increments or decrements the frequency each time.

The speed is again in 10 mS increments stored in memory location &71 and the lower limit of filter cut-off is stored in location &73. Location &72 controls whether you are currently incrementing or decrementing the frequency. Again two function keys are set up to allow this to be easily done.

The effect this program produces is much more pleasant than the first and produces either a "whooshing" effect or harmonically related sequences in any music.

The exact effect depends upon the speed and limit set.

As with most Body Build articles, the fun starts when you start doing some of

From Page 129

the work and incorporate it into your own programs. For instance it might be nice to synchronise the sweep to the start of the note — a falling sweep produces a muted gong-like noise.

This could be done in Basic or, for a real challenge to all you computer hackers, how about tapping into the envelope software and using those unused parameters in the envelope command to specify the sweep envelope? The book *Guide to the BBC ROMs* tells you what is happening and contains enough information to get you started.

Note that this filter relies upon any program not using Timer 1 in the VIA. If a program uses this, like *Islands' The Music System*, the two units are incompatible unless you drive the filter from an extra VIA on the User Port Expansion Board (Body Building, August 1984).

The only reservation I have about the results is that, as the filter requires 50 times the cut-off frequency, the output of the timer is running flat out and there is not a fine degree of control.

It would be nice if the output of the user port could be frequency multiplied, but that will require another piece of hardware and another month sometime.

● *Next month, tune in for another addition which can be made to this most versatile of computers.*

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See order Form on Page 176

```

10 PRINT"THE BEEB BODY BUILD COUR
E"
20 PRINT"SEPTEMBER 1985"
30 PRINT"By Mike COOK"
40 PRINT"Program 1 TREMLO"
50 FOR PASS=0 TO 2 STEP 2
60 PX=%A00
70 [
80 OPT PASS
90 LDA %FE4D \ Internal VIA
100 ROL A
110 ROL A \ Get 10ms time out bit
120 BCC CONT \ Continue if it is no
t
130 DEC %70 \ Decrement counter
140 BNE CONT \ If not timed out
150 LDA %71
160 STA %70 \ Restore time
170 LDA %FE66 \ Toggle clock frequ
ncy
180 EOR %72 \ With stored bit patte
rn
190 STA %FE66 \ Change Clock
200 .CONT \ Get back to interrupt r
outine
210 PLA \ Restore status
220 PHA \ Restore stack
230 JMP %DC93
240 .INIT \ Re-Vector ISR
250 SEI
260 LDA %A
270 STA %205
280 LDA %0
290 STA %204
300 CLI
310 RTS
320 ]
330 NEXT
340 REM ENABLE CLOCK OUT ON USER PO
RT BIT 7
350 %FE6B=%C0
360 REM SET FOR MAXIMUM CLOCK FREQU
NCY
370 !%FE64=0
380 %70=1
390 %71=1
400 REM SET DEPTH
410 %72=7
420 CALL INIT
430 *KEY0 P."SPEED":%71=
440 *KEY1 P."DEPTH":%72=
450 PRINT"PATCH NOW INSTALLED"

```

Listing I

```

10 PRINT"THE BEEB BODY BUILD COUR
E"
20 PRINT"SEPTEMBER 1985"
30 PRINT"By Mike COOK"
40 PRINT"Program 2 FILTER SWEEP"
50 FOR PASS=0 TO 3 STEP 3
60 PX=%A00
70 [
80 OPT PASS
90 LDA %FE4D \ Internal VIA
100 ROL A
110 ROL A \ Get 10ms time out bit
120 BCC CONT \ Continue if it is not
330 BNE CONT
340 LDA %FF
350 STA %72
360 .CONT \ Get back to interrupt r
outine
370 PLA \ Restore status
380 PHA \ Restore stack
390 JMP %DC93
400 .INIT \ Re-Vector ISR
410 SEI
420 LDA %A
430 STA %205
440 LDA %0
450 STA %204
460 CLI
470 RTS
480 ]
490 NEXT
500 REM ENABLE CLOCK OUT ON USER PO
RT BIT 7
510 %FE6B=%C0
520 REM SET FOR MAXIMUM CLOCK FREQU
NCY
530 !%FE64=0
540 %70=1
550 %71=1
560 %72=0
570 REM SET LIMIT
580 %73=7
590 CALL INIT
600 *KEY0 P."SPEED":%71=
610 *KEY1 P."LIMIT":%72=%FF:%73=
620 PRINT"PATCH NOW INSTALLED"

```

Listing II

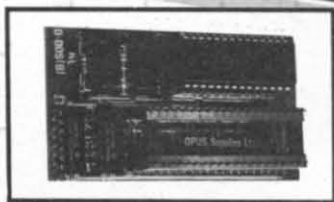
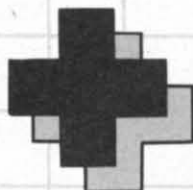
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Basic Extensions. memory but great

Basic Extensions version 1.2
MicroPower

BASIC Extensions is the first ROM released by MicroPower – better known for its games software. This 8k eeprom is both a utility for Basic programmers and a language extension incorporating four structured Pascal/Comal-like routines and four Addcomm-like graphics routines.

The 40 extra commands and keywords available are listed in Tables I and II.

Also like Addcomm, the commands are Basic style, using two byte tokens, and do not require ‘*’ prefixes.

However, a penalty of one page of workspace is required for Basic Extensions to function. Unfortunately the space is claimed by default, even though the ROM requires booting to operate and signal its presence.

The Basic programmer's aids seem to be adequate in implementation, though lacking in number. Memory status, program compacter, program verify and line relocation are fairly easy to use.

The compacter strips REMs, spaces and assembler comments from the program, though it does not let the user choose between these options.

The routines for searching and replacement of strings within a Basic program are very good, having the use of selective or global replace and wildcard facilities.

The variable dump is capable of displaying all or integer variables in decimal or hexadecimal format.

Unfortunately, however, there are no facilities for partial line renumbering, splitting of multi-statement lines or function key editing.

Disc and ROM managing facilities are not included. There are, however, utilities for merging and joining

programs together, as well as for shifting blocks of memory or program lines around RAM. The ROM also has an informative extended error-handling facility.

A number of additional innovative features are present. These include a decimal to binary – and vice versa – converter, and a security “pause” feature where the user can temporarily lock the machine with a password while leaving the machine unattended.

And at long last the “continue” feature, commonplace in Microsoft Basic, has been reintroduced to BBC Micro users. This allows a program to be continued from the statement following a previous interrupt – say an error or Escape key press.

Another useful old favourite is the addition of LPRINT so that specified text may be sent to the printer only thus getting around the *FX3.2 bug in the BBC Micro's operating system.

Surprisingly, for a utility which seems to encourage structured programming, some options to assist jumping out of FOR-NEXT or GOSUB-RETURN loops are also provided.

The four graphics statements simply provide more readable alternatives to the VDU commands for setting the graphics origin and window, defining a text window and for colour changes – though the latter still require numerical arguments.

The major feature of this utility ROM is its enhancement of the Basic language by introducing the following four new structures:

WHILE ... ENDWHILE loop

This is an improvement on the REPEAT ... UNTIL loop, as it tests for true conditions and does this before actually entering the loop.

CASE ... WHEN ... OTHERWISE ... ENDCASE structure

This can act as a multistatement ON ... GOTO. It is particularly useful for the menu or choices part of a program WHEN the variable allocated to CASE is equal to a particular value, that section of the program is executed or a procedure is called.

LOOP ... EXITIF ... THEN ... ENDEXIT ... ENDLOOP structure

This is a loop structure which can be jumped out of if a condition is true. It is rather like using IF ... THEN ... GOTO in the middle of a FOR ... NEXT or REPEAT ... UNTIL loop except that the loop is properly closed. I am not sure that this one actually encourages “structured programming”. **FIF ... THEN ... ELSEIF ... ENDIF conditions**

This allows for a multistatement version of IF ... THEN ... ELSE. It is much clearer than the usual Basic version and can be spread over separate lines.

The manual of 44 pages is very good throughout and particularly helpful where the language structures are concerned by providing worked examples. A reference card is also included among MicroPower's excellent packaging.

An extra enhancement is also described whereby procedures may be called without using the PROC statement – though this can lead to confusion when debugging a program.

Furthermore, extra LISTO options are provided to properly indent these new structures.

Some information is also given to assist programmers to add new extension commands of their own – though you would need a fair knowledge of machine code for this.

The major fear of writing programs with extended language statements is portability to other machines. However,

..greedy on on value

MicroPower do offer a cassette with a "RUN TIME MODULE" which allows Extended Basic programs to be run without the chip being present.

This is said to be available for a nominal cost — though I haven't yet been able to get hold of one, so cannot cover its effectiveness.

Last, but not least — is this utility second (6502) processor compatible? The answer is YES — if you have the second processor version of the chip. This doesn't have the security option, but does have extra facilities to read or write to the input-output processor and shift memory between the two.

These last comments are based on statements in the manual, as I did not have access to a second processor version for test.

In conclusion, Basic Extensions is not the best Basic programmers' toolkit on the market as it lacks such features as a cross-referencer, tracer, screen editor, listing formatter, partial renumbering and function key editing.

However, it does have a reasonable search and replace, variable dump and compacter, which may be all that is needed in many circumstances.

Its value is in providing new Basic language structures for loops and conditions and to make graphics coding more readable. In this respect it may be especially useful in teaching structured programming in Basic without having to change over to Coman or even Pascal.

Though this utility does not have the option of switching off other ROMs, it did not crash with the more popular ones and did have the option to KILL itself.

It is just a pity it gobbles up a page of memory by default — though, at a cost of under £20 for nearly 40 extra commands, it would still seem to be good value for money.

FIND	Locate specified string in program and list lines.
CHANGE	Global search and replace of specified string.
REPLACE	Selective search and replace of specified string.
COMPACT	Shortens program by removing spaces, REMs and assembler comments.
SHIFT	Moves selected lines of a program to new location.
DUMP	Gives contents of variables in decimal or hexadecimal.
CONT	Continues execution of program from next statement.
DTOD	Converts decimal input to binary.
BTOD	Converts binary input to decimal.
STATUS	Indicates memory used by program and variables.
SECURE	Allows entry of a password to temporarily lock the micro.
WILDCARD	Allows alternate characters to be used as wildcard.
MERGE	Merges a program from the filing system into one in memory.
JOIN	Appends program from file to the end of one in memory.
VERIFY	Checks that a saved program is loadable and identical to the one in memory.
VIEW	Gives a Basic listing of a program directly from file.

Table I: Basic Extensions direct commands

LPRINT	Directs output to printer only.
MEMSHIFT	Moves a block of memory within or between processors.
SETCOLOUR	Selects displayed colour from logical colours.
SETTEXT	Sets a text window.
SETGRAPHIC	Sets a graphic window.
ORIGIN	Sets the graphics origin.
FPOP	Removes the last FOR ... NEXT loop from the stack.
GPOP	Removes the last RETURN from the GOSUB stack.
KILL	Turns off Basic Extensions.
WHILE .. ENDWHILE	
CASE .. WHEN .. OTHERWISE .. ENDCASE	
LOOP .. EXITIF .. THEN .. ENDEXIT .. ENDLOOP	
FIF .. THEN .. ELSEIF .. ENDIF	
Language extensions see text.	

Table II: Basic Extensions program statements

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0000	00	00	00	FF	0000000	00	00
.CODE							
4C50	BIT	SPILL-1					
4C60	BPL	GOODMATCH					
4C62	JMP	(STARTVEC)					
.GOODMATCH							
4C65	LZW	INCHX					
4C68	LZW	#0C					
.NEWSTORE							
4C6A	LZA	(STOPPED),Y					
4C6D	STA	SPILLX					
4C70	DSX						
4C71	DYX						
4C72	BPL	NEWSTORE					
.INLAN							
4C74	JSR	TURBIFIND					
4C77	BQD	HIRAM					
4C79	LZA	#ROUTERK					
4C7B	STA	RRRVEC					
.JSR TURBIFIND							

Debugging Screen

PC	A	X	Y	SP	HEXDEC	STACK	I
4C74	00	FF	00	FF	1010001	02	45
4500	00	FF	00	FF	1010000	00	00
.CODE							
4C50	BIT	SPILL-1					
4C60	BPL	GOODMATCH					
4C62	JMP	(STARTVEC)					
.GOODMATCH							
4C65	LZW	INCHX					
4C68	LZW	#0C					
.NEWSTORE							
4C6A	LZA	(STOPPED),Y					
4C6D	STA	SPILLX					
4C70	DSX						
4C71	DYX						
4C72	BPL	NEWSTORE					
.INLAN							
4C74	JSR	TURBIFIND					
4C77	BQD	HIRAM					
4C79	LZA	#21					
4C7B	STA	RRRVEC					
.JSR INLAN							

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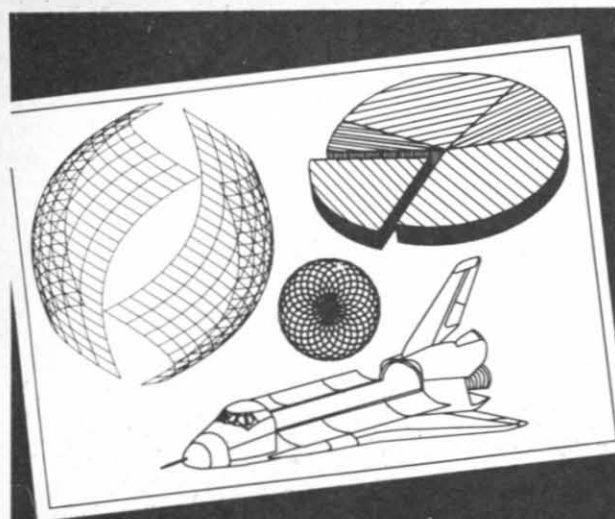


Variable listing

From Page 124

10 REM*****	490 CMP#2	\either 0 o	970 .nameip	\60 through
20 REM** Variable Lister **	r 1		980 LDA(pointer),Y	\rest of na
30 REM* By W.R.Lewis 1985 *	500 BCS notres	\then print	ee	
40 REM*****	510 LDA#&FF	\resident	990 BEQ endofname	\to see
50 REM (c) The Micro User	520 STA pointer	\integer	1000 CMP#ASC"Z"	\what type
60 REM*Zero Page Usage*	530 LDA#3	\variables	of	
70 REM	540 STA pointer+1		1010 BNE notint	\variable i
80 IWA=&2A	550 .resintlp		t	
90 FWA=&4B	560 LDA pointer	\Routine to	1020 LDA#1	\is
100 pointer=&70	570 CLC:ADC#1	\print out	1030 STA vartype	
110 name=&72	580 LSR A:LSRA	\resident	1040 .notint	\1=integer
120 REM	590 CLC:ADC#ASC"@"	\integer	1050 CMP#ASC"@"	\2=floating
130 oswrch=&FFEE	600 JSR oswrch	\variables	1060 BNE notstr	\point
140 osnewl=&FFE7	610 LDA#ASC"Z"		1070 LDA#3	\3=string
150 userv=&200	620 JSR oswrch		1080 STA vartype	
160 vptable=&400	630 JSR intmain		1090 .notstr	
170 SWA=&600	640 JSR prt		1100 CMP#ASC"("	\See if its
180 delete=&7F	650 LDA pointer		1110 BNE notbrck	\an array
190 REM	660 CMP#&68		1120 LDA vartype	
200 REM BASIC 11 : BASIC 1	670 BNE resintlp		1130 ORA#4	
210 convasc=&9EDF:REM &9ED0	680 OPT FNcheck(start+&49,680)		1140 STA vartype	
220 fpunp=&A3B5 :REM &A3A6	690 .notres		1150 .notbrck	
230 prtdec=&991F:REM &98F1	700 LDA#&82		1160 JSR incpoint	
240 REM	710 STA startvar	\Look at ta	1170 JMP nameip	
250 MODE7	ble		1180 .endofname	
260 opt=2	720 .lookup	\to see if	1190 LDA vartype	\Call the
270 start=&900	730 LDX startvar	\there is a	1200 CMP#4	\appropriat
280 FOR PASS=0 TO opt STEP opt	740 LDA vptable+1,X	\variable	e	
290 PX=start	750 BNE yes	\begining	1210 BCS diain	\subroutine
300 OPT PASS	760 JMP no	\with that	1220 LDA vartype	
310 .code	770	\letter	1230 AND#3	
320 LDA#varlist MOD 256 \Initialise	780 .yes		1240 CMP#2	
so	790 LDA vptable,X	\Set pointe	1250 BNE notfloat2	
330 STA userv	r		1260 JMP float	
am	800 STA pointer	\to locatio	1270 .notfloat2	
340 LDA#varlist DIV 256 \is called	n		1280 CMP#1	
by	810 LDA vptable+1,X	\stored in	1290 BNE notint2	
350 STA userv+1	820 STA pointer+1	\table	1300 JMP int	
360 RTS	830 .scoresame		1310 .notint2	
370 .varlist	840 LDX#0	\Store	1320 JMP string	
380 CMP#0	850 LDA(pointer,X)	\location o	1330 OPT FNcheck(start+&C7,1330)	
390 BEQ iscode	f		1340 .diain	
400 RTS	860 STA nextvar	\next varia	1350 LDA x	\Check to s
410 .iscode	ble		ee	
420 TXA	870 JSR incpoint	\begining w	1360 BEQ diamover	\if you wan
d	880 STA nextvar+1	\the same	t	
430 AND#3	890 JSR incpoint	\letter	1370 LDA vartype	\that type
s	900 LDA#2		of	
440 STA x	910 STA vartype		1380 AND#3	\variable t
in	920 LDA pointer	\Store poin	o	
450 TYA	ter		1390 CMP x	\be printed
460 AND#1	930 STA name	\to rest of	1400 BEQ diamover	
470 STA y	940 LDA pointer+1	\name	1410 JMP more	
480 LDA x	950 STA name+1		1420 .diamover	
	960 LDY#0		1430 LDX#0	
			1440 .diainloop	\Put zeros

in		1930 JSR floatmain		2420 JSR incpoint	\Put intege
1450 LDA#0	\dim storag	1940 LDX#0		r	
e		1950 .count		2430 STA IWA,X	\into integ
1460 STA dim,X	\area	1960 JSR incpoint		er	
1470 INX		1970 INX		2440 INX	\working ar
1480 CPX#32		1980 CPX#4		ea	
1490 BNE dimloop		1990 BNE count		2450 CPX#4	
1500 JSR incpoint	\Store numb	2000 .prt2		2460 BNE intlp	
er		2010 JSR prt		2470 LDA y	\Check if y
1510 AND#254	\of dimensi	2020 .over		ou	
ons		2030 LDX#0		2480 BEQ nothex	\want HEX
1520 STA dimno	*2	2040 .dimak	\Increment	2490 LDA#ASC"&"	
1530 TAX		2050 INC dim+1,X	\the number	2500 JSR oswrch	\Print &
1540 .dimlp		s		2510 LDA#&FF	
1550 JSR incpoint	\Store	2060 LDA dim+1,X	\in the	2520 .nothex	\Set up
1560 DEX	\maximum	2070 BNE notzero	\brackets	2530 STA#15	\parameters
1570 STA dimmax,X	\number of	2080 INC dim,X	\checking f	2540 LDY#&40	
1580 CPX#0	\elements i	or		2550 JSR convasc	\Convert it
n		2090 LDA#0	\for number	2560 RTS	\to asc
1590 BNE dimlp	\each	2100 STA dim+1,X	\becoming	2570 .float	
1600 .dimlp2	\dimension	2110 .notzero	\greater th	2580 LDA x	\Check to s
1610 \		an		ee	
1620 JSR pname	\Print name	2120 CMP dimmax+1,X	\255	2590 BEQ floatover	\if you wan
1630 LDY dimno		2130 BNE dimlp2	\or end	t	
1640 .dimlp3	\Print out	2140 LDA dim,X	\reached	2600 CMP#2	\floating
1650 DEY	\numbers in	2150 CMP dimmax,X		2610 BEQ floatover	\point
1660 LDA dim,Y	\brackets w	2160 BNE dimlp2		2620 JMP more	
ith		2170 LDA#0		2630 .floatover	
1670 STA IWA	\commas	2180 STA dim+1,X		2640 JSR pname	
1680 DEY		2190 STA dim,X		2650 JSR floatmain	\Call main
1690 LDA dim,Y		2200 INX		2660 JSR prt	\subroutine
1700 STA IWA+1		2210 INX		s	
1710 TYA:PHA		2220 CPX dimno		2670 JMP more	
1720 JSR prtdec		2230 BNE dimak		2680 .floatmain	
1730 PLA:TAY		2240 JMP more	\End reache	2690 LDA#ASC"="	
1740 LDA#ASC","		d		2700 JSR oswrch	\Print =
1750 JSR oswrch		2250 \		2710 JSR incpoint	
1760 CPY#0		2260 OPT FNcheck(start+&170,2260)		2720 LDA pointer	\Call routi
1770 BNE dimlp3		2270 .int		ne	
1780 LDA#delete	\Delete las	2280 LDA x	\Check to s	2730 STA FWA	\to unpack
t		ee		2740 LDA pointer+1	\floating
1790 JSR oswrch	\comma and	2290 CMP#2	\if you wan	2750 STA FWA+1	\point numb
1800 LDA#ASC")"	\print a	t		er	
1810 JSR oswrch	\bracket	2300 BCC ok	\Integers	2760 JSR fpunp	\at FWA
1820 LDA vartype		2310 JMP more		2770 \	
1830 CMP#7		2320 .ok		2780 LDA y	\Check if y
1840 BNE nstr	\Call the	2330 JSR pname		ou	
1850 JSR stringmain	\appropriat	2340 JSR intmain	\Call main	2790 BEQ nothex2	\want HEX
e		2350 JSR prt	\subroutine	2800 LDA#ASC"&"	
1860 JMP over	\subroutine	s		2810 JSR oswrch	\Print &
1870 .nstr		2360 JMP more		2820 LDA#&FF	
1880 CMP#5		2370 .intmain		2830 .nothex2	\Set up
1890 BNE nint		2380 LDA#ASC"="		2840 STA#15	\parameters
1900 JSR intmain		2390 JSR oswrch	\Print =	2850 LDY#&FF	
1910 JMP prt2		2400 LDX#0			
1920 .nint		2410 .intlp			



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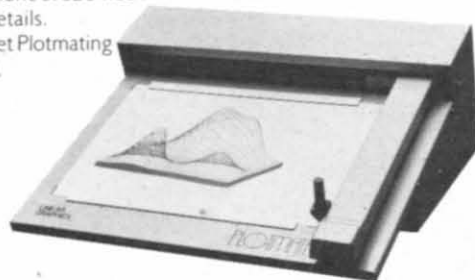
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Variable listing

From Page 137

2860 JSR convasc	\Convert it	3360 LDY#0		3810 LDA(pointer),Y	\contents o
2870 RTS	\to asc	3370 LDA(pointer),Y	\Print out	f	
2880 \		3380 JSR oswrch	\string unt	3820 RTS	\pointer
2890 OPT FNcheck(start+&1F7,2890)		il		3830 .pname	
2900 .prt		3390 JSR incpoint	\size reach	3840 LDA startvar	\Subroutine
2910 LDY#0	\Subroutine	ed		3850 LSR A	\to print
to		3400 INX		3860 JSR oswrch	\out variab
2920 .prtloop	\print out	3410 CPX strsize		le	
2930 LDA SWA,X	\string put	3420 BNE strloop		3870 LDY#0	\name
2940 JSR oswrch	\in SWA by	3430 PLA	\Restore ol	3880 .namelp	
2950 INX	\conversion	d		3890 LDA(name),Y	
2960 CPX&36	\routine	3440 STA pointer+1	\pointer	3900 JSR oswrch	
2970 BNE prtloop		3450 PLA		3910 INY	
2980 JSR osnewl	\New line	3460 STA pointer		3920 CMP#0	
2990 RTS		3470 .nostring		3930 BNE namelp	
3000 .string		3480 LDA#ASC****		3940 RTS	
3010 LDA x	\See if you	3490 JSR oswrch	\Print "	3950 .nextvar BRK:BRK	\Storage ar
3020 BEQ stringover	\want strin	3500 \		ea	
gs		3510 JSR osnewl	\New line	3960 .strloc BRK:BRK	_____
3030 CMP#3		3520 RTS		--	
3040 BNE more		3530 .more	\Is there a	3970 .startvar BRK	
3050 .stringover		ore		3980 .vartype BRK	
3060 JSR pname	\Call main	3540 LDA nextvar+1	\begining w	3990 .strsize BRK	
3070 JSR stringmain	\subroutine	ith		4000 .dimno BRK	
s		3550 BNE yes2	\same lette	4010 .x BRK	
3080 JMP more		r ?		4020 .y BRK	
3090 .stringmain		3560 .no		4030 .dim	
3100 LDA#ASC**		3570 INC startvar	\Point to n	4040 OPT FNresv(32)	
3110 JSR oswrch	\Print =	ext		4050 .dimmax	
3120 LDA#ASC****		3580 INC startvar	\letter	4060 OPT FNresv(32)	
3130 JSR oswrch	\Print "	3590 LDA startvar		4070 OPT FNcheck(start+&2FD,4070)	
3140 JSR incpoint		3600 CMP#&F6	\End reache	4080]	
3150 STA strloc	\Store poin	d ?		4090 NEXT PASS	
ter		3610 BEQ rts		4100 ZX=0	
3160 JSR incpoint	\to string	3620 JMP lookup	\Jump back	4110 FOR IX=start TO PX-1	
3170 STA strloc+1		3630 .rts		4120 ZX=ZX+?IX	
3180 JSR incpoint		3640 LDA#13		4130 NEXTIX	
3190 JSR incpoint		3650 JSR oswrch	\New line	4140 IF ZX(>)79000 THEN PRINT"Checksu	
3200 STA strsize	\Store stri	3660 RTS		m error":END	
ng		3670 .yes2		4150 CALL code	
3210	\size	3680 LDA nextvar	\Point to n	4160 PRINT"CHR#134;"Now Type :-"	
3220 \		ext		4170 PRINT" *SAVE"VAR\$ " ;~start;"	
3230 BEQ nostring	\If zero th	3690 STA pointer	\variable	~;~PX	
en		3700 LDA nextvar+1	\begining w	4180 END	
3240	\no string	ith		4190 DEFFNcheck(p,line)	
3250 LDA pointer		3710 STA pointer+1	\same lette	4200 IF PX(>)p AND PASS(>)0 THEN PRINT	
3260 PHA	\Push old	r		"Checksum error at line ";line:END	
3270 LDA pointer+1	\pointer to	3720 \		4210 =PASS	
3280 PHA	\stack	3730 JMP moresame	\Jump back	4220 DEFFNresv(n)	
3290 LDA strloc		3740 .incpoint		4230 FOR IX=1 TO n	
3300 STA pointer	\Point	3750 INC pointer	\Increment	4240 ?PX=0	
3310 LDA strloc+1	\pointer to	3760 BNE ncar	\pointer	4250 PX=PX+1	
3320 STA pointer+1	\string	3770 INC pointer+1	\checking f	4260 NEXT	
3330	\location	or		4270 =PASS	
3340 LDY#0		3780 .ncar	\overflow		
3350 .strloop		3790 \			
		3800 LDY#0	\Load A wit		
		h			

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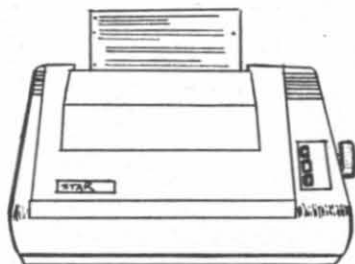
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From Page 61

```

220 IFwinOR(dead=TRUEANDLVX=0) THENP
RINTTAB(8,28)"Press To Start New Scre
en":SX=GET:GOTO140
230 END
240 DEFPROCplay
250 REPEAT
260 TX=MX:TY=MY
270 CX=32:IFhsdTHEN390
280 IFTIME>(4-LEVX)*20THENTIME=0:CH
X=CHX-1:PRINTTAB(18,0):CHX=" "
290 IFINKEY(-98)ANDMX>2THENPROCc1(
MX+1,MY):IFCX<>144THENMX=MX-1:GO
TO340
300 IFINKEY(-67)ANDMX<35THENPROCc1
(MX+1,MY):IFCX<>144THENMX=MX+1:G
OTO340
310 IFINKEY(-73)ANDMY>5THENPROCc1(
MX,MY-1):IFCY<>144THENMY=MY-1:GO
TO340
320 IFINKEY(-105)ANDMY<27THENPROCc
1(MX,MY+1):IFCY<>144THENMY=MY+1
330 IFCHX<1THENdead=TRUE:PROCexp:60
TO520
340 IFCX<>32ANDCX<>144THENdead=TR
UE
350 IFTX<>MXORTY<>MYTHENPRINTTA
B(MX,MY)CHR$133:PRINTTAB(TX,TY)CH
R$32
360 IFINKEY(-74)THENPROCc1(MX+1,MY
):IFCX=130THENPRINTTAB(MX+1,MY)CH
R$131ELSEIFCX=131THENPRINTTAB(MX+1,
MY)CHR$130
370 IFINKEY(-90)PROCc1(MX+1,MY):I
FCX<>144THENPRINTTAB(MX+1,MY)CHR$3
2
380 IFINKEY(-106)PROCc1(MX+1,MY):
IFCY<>144THENPRINTTAB(MX+1,MY)CHR$
131
390 FORSX=1TO2
400 PROCadd:PROCc1(CX,YX)
410 IFCX=32THEN480
420 IFCX=142THENwin=TRUE:GOTO510
430 IFCX=133THENdead=TRUE
440 IFCX=129ORCX=144THENLRX=LRX*-
1:SOUND&0012,1,50,2
450 IFCX=128ORCX=144THENUDX=UDX*-
1:SOUND&0012,1,50,2
460 IFCX=131THENPRINTTAB(CX-LRX,YX
-UDX)CHR$32:TX=UDX:UDX=LRX-1:LRX=TX*
-1:PRINTTAB(CX,YX)CHR$130:SOUND&0012,
1,100,2
470 IFCX=130THENPRINTTAB(CX-LRX,YX
-UDX)CHR$32:TX=UDX:UDX=LRX:LRX=TX:PRI
NTTAB(CX,YX)CHR$131:SOUND&0012,1,150,
2

```

```

480 IFCX=32THENPRINTTAB(CX-LRX,YX-
UDX)CHR$32
490 IFCX<>32THENPROCadd:PROCc1(CX,
YX):IFCX=133THENdead=TRUE
500 PRINTTAB(CX,YX)CHR$132
510 NEXT
520 UNTILdeadORwinOR(hsd=TRUEANDINK
EY(-99))
530 *FX1,0
540 VDU29,0;0;
550 ENDPROC
560 DEFPROCstart
570 CLS:hsd=FALSE:LEVX=1:LVX=3:SCX=
0:RDY=0
580 *FX9,4
590 *FX10,4
600 VDU23:8202;0;0;0:PRINT""
610 VDU19,2,0;0;0;0
620 GCOLOR,2
630 MOVE200,400:MOVE600,600:PLOT85,
550,500:MOVE500,400:PLOT85,900,600
640 PRINTTAB(11,16)"BALL LIGHTNING"
650 SOUND0,2,4,25
660 VDU19,2,15;0;0;0
670 PROCdelay(200)
680 VDU19,2,0;0;0;0
690 VDU19,1,6,0,0,0
700 COLOUR1
710 SOUND1,2,80,25
720 FORY=16TO4STEP-1
730 RESTORE
740 FORSX=0TO16-Y:READK$:PRINTTAB(1
1,Y+5X):IFK$<>"@ THENPRINTK$:SPC(10)
ELSEPRINTSPC(20)
750 NEXT
760 NEXT
770 COLOUR3
780 DATA,"BALL LIGHTNING",0,--KEYS-
-,0,1,.....Up,.....Down,Z.....Le
ft,X.....Right,0,"RETURN Change dir
ection","COPY Erect barrier","DEL
ETE Remove barrier"
790 PRINTTAB(9,30)"Press Space To P
lay"
800 SX=GET
810 VDU19,1,1,0,0,0
820 ENDPROC
830 DEFPROCinit
840 VDU29,0;0;
850 CHX=100-RDX*10
860 dead=FALSE
870 win=FALSE
880 VDU19,2,0;0;0;0
890 UDX=0:LRX=1:CX=32:MX=3:MY=6:
TX=0:XX=7:YX=26
900 COLOUR1
910 PRINTTAB(0,3)STRING$(40,CHR$224

```

```

)
920 PRINTTAB(0,29)STRING$(40,CHR$22
4)
930 FORCX=4TO20
940 PRINTTAB(0,CX)CHR$225:SPC(30);C
HR$225
950 NEXT
960 COLOUR7
970 IFLEVX=1THENPROCsc1
980 IFLEVX=2THENPROCsc2
990 IFLEVX=3THENPROCsc3
1000 PRINTTAB(2,26)CHR$138:CHR$139
1010 PRINTTAB(2,27)CHR$137:CHR$134
1020 PRINTTAB(2,28)CHR$136:CHR$135
1030 PRINTTAB(39,RND(22)+5)CHR$238
1040 PRINTTAB(1,23)STRING$(5,CHR$(14
4))
1050 PRINTTAB(1,24)STRING$(5,CHR$(14
4))
1060 FORSX=23TO28:PRINTTAB(5,SX)CHR$
144:CHR$144:NEXT:PRINTTAB(5,26)" "
1070 PRINTTAB(MX,MY)CHR$133
1080 IFhsdTHENPRINTTAB(0,0)" " R
OTCODDAM LABORATORY'S "1:GOTO1130
1090 PRINTTAB(0,0)"LIVES=":STRING$(L
VX,CHR$(133));" "
1100 PRINTTAB(11,0)"CHARGE=":CHX
1110 PRINTTAB(23,0)"LEVEL=":STRING$(
LEVX,CHR$(143));" "
1120 PRINTTAB(33,0)"Rnd=":RDY
1130 GCOLOR,2
1140 FORSX=0TO100STEP2:SOUND1,-5,SX,
1:NEXT
1150 PROClight
1160 SOUND0,-5,4,10:VDU19,2,8;0;0;0
1170 PROCdelay(70):VDU19,2,0;0;0;0
1180 GCOLOR,0:PROClight
1190 PRINTTAB(1,24)STRING$(5,CHR$(14
4))
1200 PRINTTAB(1,23)STRING$(5,CHR$(14
4))
1210 FORSX=23TO28:PRINTTAB(5,SX)CHR$
144:CHR$144:NEXT
1220 TIME=0
1230 ENDPROC
1240 DEFPROCc1(HX,KX)
1250 VDU31,HX,KX:AX=135
1260 CX=USR(&FFFF4)
1270 CX=CXAND&FFFF
1280 CX=CXDIV&100
1290 ENDPROC
1300 DEFPROCadd
1310 X=X+LRX:Y=Y+UDX
1320 ENDPROC
1330 DEFPROClight
1340 MOVE120,165:MOVE210,350:PLOT85,
180,280:PLOT85,190,270:PLOT85,170,240

```

```

:MOVE330,410:PLOT85,320,360:MOVE300,3
10:PLOT85,440,410
1350 MOVE115,165:MOVE210,160:PLOT85,
190,140:MOVE160,110:PLOT85,350,160
1360 ENDPROC
1370 DEFPROCdead
1380 LVX=LVX-1
1390 COLOUR2
1400 VDU19,2,0;0;0;0
1410 PRINTTAB(MXX,MYY)CHR#236+CHR#8+
CHR#10+CHR#237
1420 COLOUR7
1430 PRINTTAB(MXX+3,MYY)"ARGHH!!"
1440 SOUND0,2,4,10:SOUND0,-10,3,20
1450 PROCdelay(100):IFLVX<1THENPRINT
TAB(15,15)"GAME OVER":ELSEPRINTTAB(17
,15)"DEAD"
1460 VDU19,2,2;0;0;0;0
1470 ENDPROC
1480 DEFPROCwin
1490 SOUND1,3,100,25
1500 IFLVX>2THENLEVX=1:RDV=RDV+1ELS
ELEVX=LEVX+1
1510 PRINTTAB(15,15)"YOU WIN!"
1520 PROCdelay(200)
1530 SCV=SCV+CHX
1540 COLOUR2
1550 ENDPROC
1560 DEFPROCscore
1570 CLS
1580 COLOUR1
1590 PRINTTAB(13,10)"HI-SCORE=";:COL
OUR7:PRINT;HCX(1)
1600 COLOUR1
1610 PRINTTAB(12,12)"YOUR SCORE=";:C
OLOUR7:PRINT;SCX
1620 ENDPROC
1630 DEFPROCdelay(DX)
1640 TIME=0:REPEATUNTILTIME>DX
1650 ENDPROC
1660 DEFPROCexp
1670 VDU29,(XX)*32+16;((32-YY)*32-16
);
1680 VDU19,2,0;0;0;0;0
1690 GCOLOR,2
1700 FORX=0TO2*PISTEP.5
1710 MOVE0,0
1720 MOVESIN(X*PI/4)*10,COS(X*PI/4)*
10:PLOT85,SIN(X)*150,COS(X)*150
1730 NEXT
1740 VDU19,2,8;0;0;0;0
1750 GCOLOR,3
1760 SOUND0,-15,4,10
1770 SOUND0,-15,3,5
1780 ENDPROC
1790 DEFPROCsd
1800 CLS

```

```

1810 hsd=TRUE
1820 LVX=0:LEVX=2:PROCinit
1830 VDU19,2,2,0,0,0:COLOUR2
1840 PRINTTAB(10,8)STRING$(21,CHR#14
4)
1850 PRINTTAB(10,20)STRING$(21,CHR#1
44)
1860 FORSX=9TO19:PRINTTAB(10,SX)CHR#
144;SPC19;CHR#144:NEXT
1870 FORS1X=1TO4
1880 FORSX=1TO4
1890 IFCX(SX+1):HCX(SX)THENTX=HCX(S
X):T=HCX(SX):HCX(SX)=HCX(SX+1):HCX(S
X)=HCX(SX+1):HCX(SX+1)=TX:HCX(SX+1)=T
$
1900 NEXT:NEXT
1910 COLOUR3
1920 FORSX=1TO5:PRINTTAB(13,17-SX);H
CX(SX);TAB(18,17-SX);LEFT$(HCX(SX),7)
;:NEXT
1930 COLOUR1
1940 PRINTTAB(15,18)"PRESS SPACE";TA
B(16,18)"HI_SCORES"
1950 COLOUR3
1960 PROCplay:CLS:dead=TRUE
1970 VDU19,2,0,0,0,0:COLOUR3
1980 ENDPROC
1990 DEFPROCsc1
2000 FORY=4TO28:PRINTTAB(26,Y)CHR#24
0;CHR#240:NEXT
2010 PRINTTAB(26,24)" ";TAB(26,25)"
"
2020 FORX=15TO27:PRINTTAB(X,22)CHR#2
40;TAB(X,23)CHR#240;:NEXT
2030 PRINTTAB(16,22)" ";TAB(16,23)"
"
2040 FORY=8TO23:PRINTTAB(14,Y)CHR#24
0;:NEXT
2050 PRINTTAB(16,8)STRING$(4,CHR#240
+" ")
2060 PRINTTAB(16,12)STRING$(4,CHR#22
7+" ")
2070 PRINTTAB(16,26)CHR#227
2080 ENDPROC
2090 DEFPROCsc2
2100 PRINTTAB(14,26)STRING$(5,CHR#32
+CHR#227);TAB(14,22)STRING$(5,CHR#32+
CHR#227);TAB(8,22)CHR#227
2110 FORX=26TO32STEP6
2120 FORY=4TO28
2130 PRINTTAB(X,Y)CHR#240;CHR#240
2140 NEXT:NEXT
2150 PRINTTAB(16,15)STRING$(10,CHR#2
40)
2160 PRINTTAB(16,16)STRING$(10,CHR#2
40)
2170 PRINTTAB(26,8)" ";TAB(32,15)"

```

```

"
2180 ENDPROC
2190 DEFPROCsc3
2200 FORX=8TO24STEP2
2210 FORY=6TO16STEP2
2220 SX=RD(5):IFSX>5THENPRINTTAB(X,
Y)CHR#227
2230 NEXT:NEXT
2240 PRINTTAB(16,26)CHR#227
2250 SX=4
2260 FORX=26TO30STEP4
2270 FORY=5TO20+5STEP4
2280 PRINTTAB(X,Y)CHR#240;CHR#240;TA
B(X,Y+1)CHR#240;CHR#240
2290 NEXT:SX=6:NEXT
2300 ENDPROC
2310 DEFPROCdefch
2320 VDU23,224,255,255,204,204,51,51
,255,255
2330 VDU23,225,243,243,207,207,243,2
43,207,207
2340 VDU23,226,192,224,112,56,28,14,
7,3
2350 VDU23,227,3,7,14,28,56,112,224,
192
2360 VDU23,228,60,126,255,255,255,25
5,126,60
2370 VDU23,229,56,56,147,126,16,60,3
8,99
2380 VDU23,230,8,28,62,8,62,8,62,8
2390 VDU23,231,8,8,28,28,28,28,254,2
54
2400 VDU23,232,48,48,48,48,48,48,255
,255
2410 VDU23,233,48,48,48,48,48,48,48,
48
2420 VDU23,234,0,63,63,48,48,48,48,4
8
2430 VDU23,235,0,254,254,28,8,0,0,0
2440 VDU23,236,28,42,62,20,9,119,136
,182
2450 VDU23,237,8,54,8,22,50,34,35,96
2460 VDU23,238,255,57,15,1,1,15,57,2
55,48
2470 VDU23,239,48,60,63,60,48,32,32,
112
2480 VDU23,240,255,255,195,195,195,1
95,255,255
2490 ENDPROC

```

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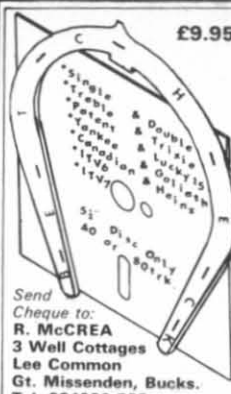
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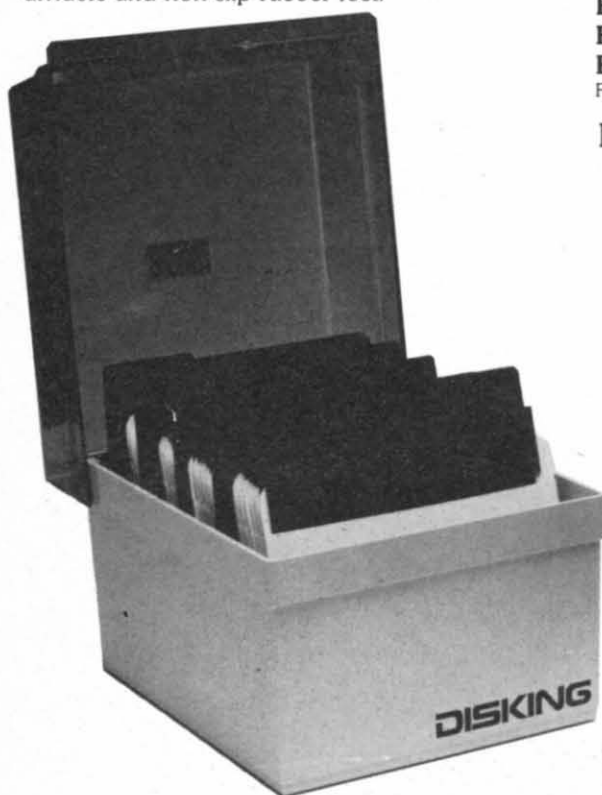
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Quarters listing

From Page 113

```

880 totalscore(i)=0
890 totalscore(2)=0
900 xspot=245;yspot=145
910 oldxspot=xspot;oldyspot=yspot
920 ENDPROC
930 DATA1111,2222,3333,4444
940 DATA1112,1113,1114
950 DATA2221,2223,2224
960 DATA3331,3332,3334
970 DATA4441,4442,4443
980 DATA1122,1133,1144
990 DATA2233,2244,3344
1000 DATA1212,1313,1414
1010 DATA2233,2424,3434
1020 DATA1123,1132,1124
1030 DATA1142,1134,1143
1040 DATA2213,2231,2214
1050 DATA2241,2234,2243
1060 DATA3314,3341,3324
1070 DATA3342,3312,3321
1080 DATA4412,4421,4413
1090 DATA4431,4423,4432
1100 DATA1213,1214,1314
1110 DATA2123,2124,2324
1120 DATA3132,3134,3234
1130 DATA4142,4143,4243
1140 DATA1234,1243,1324
1150 DATA1342,1423,1432
1160 DEFPROCseparate(NX)
1170 N4=NXMOD10
1180 N3=(NXDIV10)MOD10
1190 N2=(NXDIV100)MOD10
1200 N1=NXDIV1000
1210 ENDPROC
1220 DEFNrotate(QX)
1230 =QXMOD1000+10+QXDIV1000
1240 DEFPROCrotation(player)
1250 GX=FNrotate(NX)
1260 NX=GX
1270 PROCseparate(NX)
1280 PROCdomino(displayX(player),displayY(player),N1,N2,N3,N4)
1290 ENDPROC
1300 DEFPROCaction
1310 PROCmove
1320 *FX4,1
1330 UX=0;VX=35
1340 REPEAT
1350 player=1
1360 UX=UX+1
1370 PRINTTAB(0,2);UX
1380 NX=dominoX(UX)
1390 PROCseparate(NX)
1400 PROCsound(100+player*15,1)
1410 PROCdomino(displayX(player),displayY(player),N1,N2,N3,N4)
1420 PROCkey(player)
1430 VX=VX+1
1440 player=choice
1450 IFchoice=3 THEN player=2
1460 PRINTTAB(17,2);VX-35
1470 NX=dominoX(VX)
1480 PROCseparate(NX)
1490 PROCsound(100+player*15,1)
1500 PROCdomino(displayX(player),displayY(player),N1,N2,N3,N4)
1510 IFchoice=3 THEN PROCcomputer ELSE PROCkey(choice)
1520 UNTILVX>J-1
1530 ENDPROC
1540 DEFPROCmove
1550 colour=POINT(oldxspot+d,oldyspot)
1560 oldxspot=xspot
1570 oldyspot=yspot
1580 xspot=xspot+move
1590 yspot=yspot+move
1600 IF xspot<200 OR xspot>1010 THEN xspot=oldxspot
1610 IF yspot<100 OR yspot>910 THEN yspot=oldyspot
1620 PROCspot(oldxspot,oldyspot,colour)
1630 colour=8
1640 PROCspot(xspot,yspot,colour)
1650 oldxspot=xspot
1660 oldyspot=yspot
1670 ENDPROC
1680 DEFPROCspot(aa,bb,colour)
1690 GCOL0,colour
1700 PLOT69,aa,bb
1710 PLOT69,aa+4,bb
1720 PLOT69,aa+4,bb+4
1730 PLOT69,aa+4,bb-4
1740 ENDPROC
1750 DEFPROCcheck
1760 score=0
1770 IF POINT(xspot-a-d,yspot)=N1 THEN score=score+1
1780 IF POINT(xspot,yspot+a+d)=N2 THEN score=score+1
1790 IF POINT(xspot+a+d,yspot)=N3 THEN score=score+1
1800 IF POINT(xspot,yspot-a-d)=N4 THEN score=score+1
1810 IF score=2 THEN score=3:ENDPROC
1820 IF score=3 THEN score=5
1830 IF score=4 THEN score=7
1840 ENDPROC
1850 DEFPROCchecksum
1860 sum=0
1870 IF POINT(xspot-a-d,yspot)=0 OR POINT(xspot-a-d,yspot)=N1 THEN sum=sum+1
1880 IF POINT(xspot,yspot+a+d)=0 OR POINT(xspot,yspot+a+d)=N2 THEN sum=sum+1
1890 IF POINT(xspot+a+d,yspot)=0 OR POINT(xspot+a+d,yspot)=N3 THEN sum=sum+1
1900 IF POINT(xspot,yspot-a-d)=0 OR POINT(xspot,yspot-a-d)=N4 THEN sum=sum+1
1910 ENDPROC
1920 DEFPROCtotal(player)
1930 PROCcheck
1940 IFplayer=2 THEN tab=15 ELSE tab=0
1950 IFscore=0 THEN ENDPROC
1960 f=50
1970 FOR T=1 TO score
1980 f=f+10
1990 PROCsound(f,2)
2000 PRINTTAB(1+tab,19);score(player)+T
2010 I=INKEY(15)
2020 NEXT T
2030 score(player)=score(player)+score
2040 IF score=7 THEN PROCtopscore
2050 score=0
2060 ENDPROC
2070 DEFPROCdominoIN(player)
2080 PROCdomino(displayX(player),displayY(player),7,7,7,7)
2090 PROCdomino(xspot,yspot,N1,N2,N3,N4)
2100 ENDPROC
2110 DEFPROCdominoOUT(player)
2120 PROCdomino(displayX(player),displayY(player),7,7,7,7)
2130 ENDPROC
2140 DEFPROCsound(f,envelope)
2150 I=INKEY(20)
2160 SOUND1,envelope,f,2
2170 SOUND1,-15,f,1
2180 ENDPROC
2190 DEFPROCshuffle
2200 AX=RND(J)
2210 FOR domino=1 TO AX
2220 NX=RND(J)
2230 NEXT domino
2240 RESTORE
2250 NX=0
2260 REPEAT
2270 AX=RND(J)
2280 IF dominoX(AX) THEN 2270
2290 READ domino
2300 dominoX(AX)=domino
2310 NX=NX+1
2320 UNTIL NX=J
2330 ENDPROC
2340 DEFPROCempty
2350 FOR M=1 TO J
2360 dominoX(M)=0
2370 NEXT M

```

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MUS

Quarters listing

From Page 146

```

2380 ENDPROC
2390 DEFPROCtitles
2400 COLOUR9
2410 PRINTTAB(2,3);"Q U A R T E R S
"
2420 COLOUR7
2430 a=12
2440 REPEAT
2450 a=2*a
2460 PROCdomino(600,500,1,2,3,4)
2470 UNTIL a >300
2480 GCOLOR,7
2490 PROCspacebar
2500 ENDPROC
2510 DEFPROCchoice
2520 CLG
2530 PRINTTAB(1,6);"Choose your game
"
2540 PRINTTAB(1,12);"1 one player"
2550 PRINTTAB(1,14);"2 two players"
2560 PRINTTAB(1,16);"3 against comp
uter"
2570 PRINTTAB(1,20);"Enter 1,2, or 3
"
2580 REPEAT
2590 G=GET
2600 G=G-48
2610 UNTIL G>0 AND G<4
2620 choice=G
2630 CLG
2640 GCOLOR,7
2650 ENDPROC
2660 DEFPROClayout
2670 GCOLOR,7
2680 PRINTTAB(1,20);"Shuffling....."
2690 PROCshuffle
2700 CLS
2710 PROCgrid(200,100,2*a)
2720 PROCframe(0,730,150,120)
2730 PROCframe(55,370,90,145)
2740 PROCframe(107,730,150,120)
2750 PROCframe(1010,370,90,145)
2760 FOR player=1 TO 2
2770 PROCdominoOUT(player)
2780 NEXTplayer
2790 PRINTTAB(0,2)" Ready?(Y/N)"
2800 REPEAT:G=GET:UNTIL G=89
2810 PRINTTAB(0,2)"
"
2820 ENDPROC
2830 DEFPROCendgame
2840 PROCTopscore
2850 PROCTopscore
2860 GCOLOR,130
2870 CLG
2880 PRINTTAB(0,2)" Game over
"
2890 I=INKEY(150)
2900 IF choice=1 THEN CLS:CLG:GOTO 3

```

```

050
2910 PRINTTAB(0,2)"
"
2920 PRINTTAB(0,2)"Final scores ";sc
ore(1);" ";score(2);
2930 I=INKEY(190)
2940 IFscore(1)>score(2) THEN gamesc
ore(1)=gamescore(1)+1
2950 IFscore(2)>score(1) THEN gamesc
ore(2)=gamescore(2)+1
2960 totalscore(1)=totalscore(1)+sc
ore(1)
2970 totalscore(2)=totalscore(2)+sc
ore(2)
2980 score(1)=0:score(2)=0
2990 CLS:CLG
3000 PRINTTAB(0,2);"gamescore(1)= ";
gamescore(1)
3010 PRINTTAB(0,5);"gamescore(2)= ";
gamescore(2)
3020 I=INKEY(123)
3030 PRINTTAB(0,12);"total points(1)
=";totalscore(1)
3040 PRINTTAB(0,15);"total points(2)
=";totalscore(2)
3050 IF score(1)>Hscore THEN Hscore
=score(1)
3060 IFchoice<>1 THEN GOTO3090
3070 PRINTTAB(0,5);"Highest score i
s ";Hscore
3080 PRINTTAB(1,9);"Your score was "
;score(1)
3090 score(1)=0
3100 I=INKEY(123)
3110 PROCspacebar
3120 GCOLOR,128
3130 ENDPROC
3140 DEFPROCkey(player)
3150 REPEAT
3160 G=GET
3170 UNTIL G=127 OR G=136 OR G=137 O
R G=138 OR G=139 OR G=82 OR G=80
3180 IF G=127THEN PROCsound(5,2):PRO
CdominoOUT(player):I=INKEY(8):GOTO 32
60
3190 IFG=136 THEN xmove=-2*a:GOTO 32
50
3200 IFG=137 THEN xmove=+2*a:GOTO 32
50
3210 IFG=138 THEN ymove=-2*a:GOTO 32
50
3220 IFG=139 THEN ymove=+2*a:GOTO 32
50
3230 IFG=82 THEN PROCrotation(player
):GOTO 3150
3240 IF G=80 THEN PROCchecksum:IFsum
=4 THEN PROCdominoIN(player):PROCTota
l(player):PROCmove:GOTO 3260:ELSE PRO
CdominoOUT(player):GOTO 3260
3250 PROCmove:xmove=0:ymove=0:GOTO 3

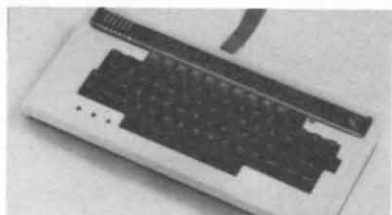
```

```

150
3260 xmove=0:ymove=0
3270 ENDPROC
3280 DEFPROCcomputer
3290 pp=xspot:qq=yspot
3300 player=2
3310 compX=155:compY=145
3320 REPEAT
3330 print=0
3340 REPEAT
3350 compX=compX+2*a
3360 PROClimits
3370 P=POINT(compX+12,compY)
3380 IF compY>945 THEN P=0:count=4:p
rint=1
3390 UNTIL P=0
3400 count=0
3410 xspot=compX:yspot=compY
3420 REPEAT
3430 PROCchecksum
3440 IF sum=4 THEN PROCdominoIN(play
er):PROCTotal(player):count=4:print=1
:GOTO3460
3450 PROCrotation(2)
3460 count=count+1
3470 UNTIL count>4
3480 UNTILprint=1
3490 xspot=pp:yspot=qq
3500 ENDPROC
3510 DEFPROClimits
3520 IFcompX>975 THEN compX=245:comp
Y=compY+2*a
3530 ENDPROC
3540 DEFPROCTopscore
3550 SOUND1,2,40,12
3560 ENDPROC
3570 DEFPROCspacebar
3580 PRINTTAB(2,29);"Press SPACE bar
"
3590 REPEAT
3600 G$=GET$
3610 UNTIL G$=""
3620 ENDPROC
3630 DEFPROCInstructions
3640 PRINTTAB(3,3);"The flashing spo
t is moved by the"" cursor arrows
"
3650 PRINTTAB(3,7);"R' will rotate
the domino "" currently on display
"
3660 PRINTTAB(3,11);"P' plays the d
omino at the"" position of the fla
shing spot"
3670 PROCspacebar
3680 ENDPROC

```

This listing is included in this month's cassette tape offer. See order form on Page 173.



The Microtest BCASE

Are you fed up with your computer looking more like a junior construction set than a piece of High Tech equipment? Is your computer case made of flimsy plastic? Does it sag when you put a book on it?

Now is the time to do something about it!!!

The new compact MICROTEST BCASE has taken over 18 months to develop by

our R & D section. We feel (probably with some bias) that there is nothing currently on the market to compare to it!

The CPU housing is made from plated steel with an external acrylic bonded vinyl coating. So its light, tough but good looking and just as important easily cleaned. It houses your BBC computer board (all issues of B and B+) and power supply, as well as single or twin disc drives if required. It maintains the use of standard BBC Computer connectors, and can if required be fitted with a 3" fan for additional cooling.

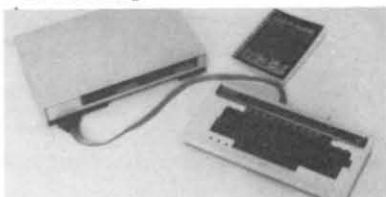
The BCK detached Low Profile Keyboard case is also made of steel and houses the existing BBC Computer Keyboard. Inc. 600mm cable and Break Key Lock.

The BCNK detached Low Profile Keyboard has a separate numeric pad for those of you that need fast and efficient

numeric input. Inc. 600mm cable, Break Key Lock and numeric pad.

CPU Main board housing £53.00
BCK Keyboard case £32.00
BCNK Keyboard case £44.00

Carriage £4.00 for keyboards, £4.00 for CPU case or £6.00 for keyboard and CPU case. Units are priced individually so that users could run a detached keyboard from an existing BBC computer, please state when ordering.



DisCat

DisCat creates disc labels and catalogues the files on all your discs, creating a wealth of information which can be accessed by DisCat's own built in database whenever you need to find a file or reference.

DisCat is easy to use and makes printing labels for your discs the simplest of tasks. Create labels for your whole collection of discs or just for one.

Additional information shows you the size of the disc (40 or 80 track, single or double density) and the amount of space used. Each disc is tagged with a volume number for easy identification. There is room for a comment on the label plus the date catalogued and the number of files present on the disc.

As each disc is catalogued you are given the opportunity not only to add comments to the disc label but to also make comments beside each file held on the disc. DisCat's built in database provides full database facilities allowing the resulting information to be searched for any filename or reference.

DisCat uses standard sized labels and comes with 50 labels to get you going. Plus a comprehensive manual.

DisCat - £14.95
Please add £1.00 P&P

Microtest List Manager

A Data Filing System for the BBC Microcomputer

A disc-based database for the BBC model B on disc that is both sophisticated yet easy to use. LIST MANAGER has been specifically designed to introduce the newcomer to the concept of databases with friendly menus, command prompts, data entry and editing routines. With the aid of comprehensive and comprehensible documentation, the user is encouraged to make the most of the BBC's disc storage system and LIST MANAGER's data handling powers. Software features include the following:

(a) Records automatically sorted alphabetically as they are entered, and may subsequently be retrieved in their file sequence or alphabetically without need for slow sorting routines;

(b) Records may be up to 255 characters long, contain up to 255 fields, and need not be restricted to the size of the screen;

(c) Existing files may be restructured to increase or decrease particular field lengths, delete unwanted fields or even introduce entirely new ones, allowing you to completely reformat your file at any time;

(d) File size is limited only by disc capacity relative to chosen record length, permitting a typical file to contain between 1000 and 2500 records, or twice as many with the 80 track disc drive;

(e) Powerful search facility is provided and also a very friendly file editor;

(f) Address labels may be printed out from files, using your selection of fields.

(g) 'User option' allows you to write your own Basic routines to perform any desired calculations or manipulations on stored data.

LIST MANAGER is available from MICROTEST on disc with full manual at **£14.95** inc postage and packing. Please state 40 or 80 track when ordering.

Disc Menu ROM

The MICROTEST DISC MENU ROM has been designed to alleviate problems caused by multiple disc files and has been created especially for those with little time and a lot of trouble on their hands (e.g. teachers).

THE OLD METHOD - When you have a disc of say 31 programs isn't it time consuming and frustrating to catalogue and select the file you require from disc? Even after all of that, you then have to load it.

All that's now been superseded thank goodness.

THE NEW METHOD - Take your disc and place it in the drive of your choice (it does not have to be drive 0). Now instead of SHIFT-BREAK you boot the disc with 0-BREAK for drive 0, 1-BREAK for drive 1, 3-BREAK for drive 3 etc. The disc then provides you with a Menu from which you choose the corresponding letter/program. Press that letter and you're off.

Something that could have taken you a couple of minutes now can be done in as little as five seconds.

Also included in the Menu ROM is a Formatting utility and an intelligent verify utility. So even if your disc does crash on you the Menu ROM can now try to automatically repair it after verifying.

The Disc Menu ROM
£12.95
P&P £1.00



It's here, the New Issue 2+

Starstick ROM & Quickshot Joystick

Picture shows Starstick ROM, Patchlead and Quickshot Joystick (along with Acornsoft's Elite Package - by kind permission of Acornsoft)

This new release of the very popular Starstick & Quickshot programmable joystick offers new possibilities. Over 30 extra commands which include: *Elite, *Replica, *Sneaky, *Plonk, *Adval, *Prop, *Kill, *Revive, *Reset, *Repeat, *Map, *Ksave, *Kload, *Cursor and *Stick. Fully help driven format with 20 page manual including full fitting instructions.

Not only is the package fully programmable, but it's response time is also user variable. Thus giving YOU the ability to tailor the joystick to YOUR requirements, as only YOU can.

The new issue software is fully compatible with Disc versions of Acornsoft's 'Elite', Acornsoft's 'Aviator' and Clares 'Replica'. It features relocatable workspace to enable it to work with many of the few games it would not work with before. As in the previous issue, the Starstick ROM is fully TUBE compatible.

Specifically designed with the Disc user in mind, the software is not affected by any

combination of the BREAK, SHIFT, or CONTROL keys.

The self centring, rapid action Joystick plugs into the user port and is managed by the Starstick ROM. The ROM monitors O.S. calls and patches the joystick into games programs. The Starstick functions with most games and even those that are not designed to function with joysticks. IT IS VERY IMPORTANT HOWEVER THAT THE GAMES USE LEGAL OPERATING SYSTEM CALLS AS MOST DO.

The New prices are:

Starstick ROM (version 2+) and Quickshot II £29.50
Starstick ROM (version 2+) and Patch lead £25.30
Starstick ROM (version 2+) £19.55
Starstick ROM Reprogramming Charge £5.50

The Patch lead option allows you to plug any ATARI/SPECTRUM Style joystick into the BBC computer with the STARSTICK ROM.

PLEASE INCLUDE £1.00 for CARRIAGE and packing. Also included in the package is a powerful ROM Manager to enable you to 'KILL' (temporarily) any ROMs that might cause you problems.

All commands in MICROTEST ROMs can be prefixed by 'M' should any other ROM try to intercept the same command name.

TUBE is a registered trade mark of ACORN COMPUTERS LTD. Screen shot is 'ELITE' by kind permission of ACORN SOFTWARE LTD.

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Tel: 0208 3812. Bulletin board
 (Prestel compatible) 0208 77677.
 Dealer and Export Enquiries Welcome



BHL SOFTWARE PRESENTS GEOGRAPHY U.K.

This educational and utility package, as used in schools and colleges, will produce a high resolution map of Great Britain and features:

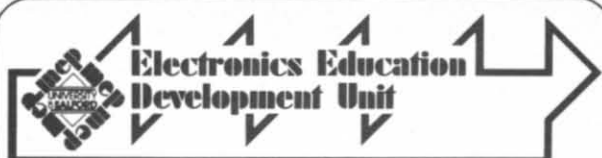
- * ZOOM-IN on any area * 3 Magnifications * Screen Save & Load * Index of over 170 Towns & Cities, for fast, accurate plotting * Will draw all the Counties of England and Wales quickly and accurately * Full on screen editing, including BOX, TEXT, LINE, FILL * Screen Dump * Enables you to add your own individual features * Single Key Entry * Comprehensive Manual * Function Key Overlay * For BBC(B) only.

EUROPE 85

This has all of the above features, except Counties, but utilises a high resolution map of Europe, East & West, for its operation. Each package is **£8.95 Tape** or **£11.95 Disc**, incl. VAT & P&P. Please state 40/80 track.

SPECIAL OFFER: When ordering 2 or more items DEDUCT £1.00 per item.
Send Cheques/PO to:

BHL SOFTWARE
21 Elmsmere Road, Didsbury, Manchester M20 0AB
(Send SAE for further information)



Would you like to use your skills and knowledge of the BBC computer to develop useful materials for schools?

The Electronics Education Development Unit at Salford University is funded by the Microelectronics Education Program to develop materials for work on electronics in schools. We do not develop "computer-aided-learning" material but do have occasional need for software development for eg. scientific data collection, computer-aided-design and other specialised needs.
If for a hobby you enjoy tackling challenging work on your BBC, have a sound knowledge of BASIC, assembler and the BBC operating system, have a clear, structured approach to program design, write reliable and user-friendly software, are a creative programmer, can work to a clearly defined brief and would like to be (modestly!) rewarded for doing all this please write to:
John Martin, MEP Electronics Education Development Unit, Salford University, Salford, Lancs. M5 4WT, giving details of your self, your experience and a sample of recent BBC software you have developed (including a clear statement of its purpose).



Now you can use the superb **AMX ART** software without the mouse or its ROM.

NORTHSOFT MOUSETRAP patches **AMX ART** to use either: (1) RB2 Tracker Ball (2) Joystick (3) Grafpad or (4) Keyboard.

NOTE: **AMX ART** plus **MOUSETRAP** runs WITHOUT the MOUSE driver ROM.

NORTHSOFT MOUSETRAP is available from:

Northside Computing
14 Cedarwood Road,
Dublin 11, Ireland

£5.95 cassette
£6.95 disk
incl. P&P

27128 EPROM

Hitachi 250nS. The reliable ones! Price includes VAT, p&p

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BBC/Centronics Printer Cable £8.95

Prices include VAT and post and packing.

BB-PROM PROGRAMMER £33.95

Low cost, high speed programmer for 2764/27128 and 'A' Z.I.F. socket - **Driver Software in ROM** - Application Notes
Functions: CHECK, READ, BLOW, VERIFY. For BBC-B/disk

Prices include VAT & post (UK). Delivery normally by return.

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Announcing a new full-feature word processor ROM (16K) which won't burn a hole in your pocket

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FEATURES INCLUDE:

- Tape, disc & 2nd processor 6502 compatible. (Special "HiWord" 2nd processor only version available for same price).
- All formatting on screen, including 4 justification styles: left, centre, right, pad.
- On screen fonts: normal, bold, underline, italic, superscript, subscript, inverse.
- Editor features include: find & replace, block move, variable margins & tabs, backup text, 16 cursor functions, etc.
- 40 or 80 column display, with 25 or 32 lines. Text and background colour may be altered to suit your own taste.
- Up to 160 column formatting (using automatic left to right scrolling display).
- Full printer support, including microspacing, page headers & footers, page numbers (with Roman numeral option), double line spacing, alternate page printing (for double sided printing), overprinting etc.
- In-ROM printer setup program allows you to configure this system to suit your particular printer without having to buy costly add-on printer drivers.
- Large documents may be created over several files, which are printed as if they were one large file. This means that you are not limited by the BBC Micro's small memory.
- For Disc users: Inbuilt Mailing list & Mail Merge system (allows you to create standard letters etc.) Mailing list system may also be used separately as a mini Database.

FOR MORE INFORMATION (INCLUDING SAMPLE PRINTOUT) PLEASE SEND A STAMPED, SELF-ADDRESSED ENVELOPE.

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Telephone: 051-652 7560**

Make cheque or P.O. payable to **T. Hall**. Allow 14 days for delivery. Please specify if "HiWord" ROM is required.
(Written by the author of the Number 1 selling (April '84) Adventure game "Twin Kingdom Valley")

Dealer enquiries welcome.

Educational orders welcome.

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- ▲ Fast sprung return to centre.
- ▲ Graphite wiper linear potentiometers.
- ▲ 12 Months Guarantee.
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A superb joystick and a keypad for the price of either one. Plus the software to integrate it into the computer's system. One handset will work on it's own in the A/D port as a joystick and two fire buttons. Joystick is immediately compatible with ACORNSOFT and similar software.

The interface joins together the analogue and the user ports to use the full keypads giving a total of 24 user definable keys. The interface can also be used as a splitter for the A/D port to take two items at the same time, e.g. joystick and lightpen.

DELTA DRIVER on cassette or disc: Two programs on each cassette or disc. One converts machine code programs from the keyboard to the joystick or keypad, with adjustable sensitivity on the joystick and will run on any O.S. The second program (needs O.S. 1.0 or later and an interface) duplicates any keyboard keys on the keypads, in the operating system, so that it can become a numeric keypad or will take on the function keys.



Made in England

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Pace Software Supplies Ltd.

DURING a recent and re-occurring attack of TWHKY – The Witch Has Killed You – I resorted to the ultimate treatment. Cheating.

Diagnosis revealed an anti-dote which I prescribe to anyone suffering the same downfall – guaranteed to maintain normal body temperature, clear the lungs from polluted air, relieve tension and so aid restful recovery.

Technically, the disease known as Castle Quest is not normally addictive, but in extreme cases patients have become hooked and recovery involves complete rest following a painful operation known to some as confiscation – or, as it's more commonly known, GTLCOIWTIDTL (Get That Lawn Cut Or I Will Throw It Down The Loo).

The remedy is simple – eternal life.

Load the initial program and List it. Change Line 25 to:

25 +LOAD "CQ2"

Now add the following two lines:

27 ?&5996=200

29 CALL &4340

RUN the program and wait as usual for the main program to load. After each lost life a character will replace the number of lives you have left – for example – 4 lives left – but this will not interfere with the normal running of the game.

Two hundred lives should be enough. – John Bennett, Oakham, Leics.

PS. If anyone can help me with the finishing stages of the game it would be appreciated.

Honorary English

JAPANESE English again!

I feel that your correspondent in the June edition of Micromail has misunderstood my letter concerning the Shinwa printer.

The machine itself is excellent. Indeed, I am writing this letter on the CP80, and find it satisfactory on every point.

My criticism was, and still is,

Ultimate cure for Castle Quest syndrome

that the manual is written in such curious "English" that it presents difficulties – and this seems to me quite unwarranted.

Your correspondent suggests that there is no problem "by intelligent application of the printer control codes".

I find this less helpful than the many kindly informative letters I have received on the subject from your readers.

Far from praising the machine to the neglect of the manual, I do hope that others will protest vigorously at hodge-podges of language that don't make sense.

It doesn't cost a fortune to produce readable English, and there is little excuse for ill-written material, either for computers or the other products mentioned by your correspondent. – Edmund W. Jupp, Lymington, Devon.

Secret coding

I WAS most interested to read Robert Macmillan's letter advising that Acornsoft's new Printer Driver Generator (PDG) solves printer incompatibility problems.

Maybe I've missed something, but I have an Epson FX80 for which there's an Answer Code in the PDG which purports to solve all problems without reference to the infamous Epson Manual.

Unfortunately, when it comes to microspacing, which the FX80 supports and the old Acornsoft PDG supported, the new PDG just says "No".

When I dispute this, the program goes all coy and unhelpful. Try as I might, so far I've failed to discover the secret coding necessary to build a successful microspacing facility in a printer driver.

I've even dared rummage through the Epson manual, but that's equally coy and unhelpful

about microspacing.

I agree microspacing isn't something needed every day, but for finished text via VIEW it's a must for me.

Anyone who can help? Perhaps Mr Macmillan... – John D. Stattafor, North Watford, Herts.

● Can anyone help with John's problem? Everyone round here is a Wordwise freak...

Hated mazes

I DO agree with Alice's comments on Adventures and crosswords, and particularly about the entertainment value of Adventure Quest – NOT just because I've occasionally been consulted!

But it did reduce me to phoning Pete Austin in dire frustration at one stage.

Having read the "Dune" books, I was convinced that I had to find some hooks and ride that pesky Worm, only to get eaten ad infinitum.

So Alice shouldn't feel bad about packing-cases: there's an Achilles' heel in all of us.

What I just hate are mazes – I think they should be banned – while lousy puns a la Dungeon Adventure should be encouraged within reason. I was plain lucky with the jelly – just happened to be carrying the right thing at the right time.

Turning to Elite for a moment. Is there a market for an occasional "swapping of tips" column?

For instance, does anyone else do as I do with regard to the baddies who attack me? Having successfully demolished their ship, if the enemy uses an escape pod, scoop him up – there's a ton of slaves for a minimum effort.

Or take the Thargoid Mother Ship. It's important just to give it love-pats with the laser until all the little Thargoids have been

launched – DON'T hit them.

Then zap the Mother Ship, wait till the reward has been posted when each Thargoid can be scooped up without fuss, and it becomes Alien Items – valuable on Poor Agricultural worlds – and you can do it with a full cargo hold.

If another Mother Ship turns up they get re-activated, which is a nuisance, but at least there's the extra Alien Items to come.

I'm about to upgrade to discs, and look forward to starting all over again.

Finally, having now got Wordwise Plus and a Canon PW-1156A, I can recommend the combination to anyone who does a lot of word processing work where the need to have a variety of print styles, speeds and page widths is important. – Bob Redrup, Truro, Cornwall.

PS. You'd think they could have worked out a fanfare or something when you become ELITE!

Touch of a Strad

I HOPE I may be of assistance to Anthony Stewart – June Micromail – and others in his search for a violin-type ENVELOPE.

The main characteristic of a note played on a violin is its reed-like timbre or tone colour.

If we were trying to construct such a sound on a conventional synthesiser we would begin with a sawtooth or pulse waveform.

Unlike the Commodore 64, the BBC Micro does not have such waveforms. It only has a square wave which, especially in the lower registers, is quite reminiscent of a clarinet.

This means the BBC Micro can not produce a violin-like timbre.

However, through careful use

MICROMAIL

From Page 153

of the ENVELOPE statement we can produce a violin-like amplitude envelope – see User Guide page 184 for details of the amplitude envelope – which will go some way towards making our ears believe that what we hear is a violin.

We can also add a little vibrato for good measure.

A violin envelope will vary depending upon whether the notes played are short or long.

Long notes will typically have a slowish attack time and short notes – because they are short – a faster attack time.

Beware of making the attack time too fast, however, else the envelope will sound percussive – just right, perhaps, for pizzicato playing.

Most violinists add vibrato to enhance the tone, usually a gentle vibrato, and we can add this, too.

The following envelopes may be suitable for slow violin-like notes. The degree of vibrato is as small as is possible on the BBC Micro and although they may sound similar, there is a subtle difference:

```
ENVELOPE 1,4,0,0,1,11,0,1,
4,-1,0,3,126,00
ENVELOPE 2,2,0,0,1,2,0,2,4,
-1,0,-3,126,00
ENVELOPE 3,3,0,0,1,2,0,2,4,
-1,0,1,126,00
ENVELOPE 5,6,1,-2,1,1,1,1,
4,-1,0,-3,126,00
```

The last six parameters define the amplitude envelope and increasing the sixth-last parameter – that is the 4 – will produce a faster attack.

On the subject of violin and string-like sounds, a good chorus or ensemble effect can be produced by playing the same pitch on two or more channels simultaneously, that is:

```
SOUND £101,-12,101,200
SOUND £102,-12,101,200
```

A pitch offset has been preprogrammed into the micro's music system to produce this effect, although it varies according to the OS – that is, OS 1.0

only has an offset applied to channel 3 in relation to channel 1 while OS 1.2 has an offset applied to channel 2 and a slightly greater offset applied to channel 3.

The offset can be increased, of course, by adding 1 or more to the pitch value.

A similar sort of chorus/phasing effect can also be produced by using envelopes which have slightly different vibrato characteristics.

Fascinating stuff! Anyway, I hope there's enough information here for Anthony's violin concerto.

Further information on envelopes and instrument characteristics and all sorts of other musical goodies can be obtained from my books, *Making Music on the BBC Computer* at £5.95 and *Commodore 64 Music* at £6.95 (Sunshine Books).

A cassette of the programs in the books is also available – to alleviate sore fingers and debugging problems – from myself for £5.95. Please specify machine. – Ian Waugh, 26 Newark Drive, Whitburn, Sunderland SR6 7DF.

● This isn't the first contribution that we've had from Mr Waugh, and we hope it won't be the last.

If his books are as informative and interesting, they deserve to be successful.

Where Tab comes in

HAVING more or less got the hang of Basic, I decided to progress to Assembly Language. It soon became apparent that the ability to utilise the Tab key while typing in my programs would greatly increase readability.

I have scoured the User Guide but can find no mention at all of the Tab key – or am I missing something?

I am pulling my hair out trying to conquer this problem. Can you please bring to life this dormant key and keep my hair where it belongs? – Paul Chandler, Bicester, Oxon.

● From Basic the Tab key has no use at all as a tabulate

function like typewriters. It can, of course, be utilised in word processors to move the cursor to a defined tab setting – as with VIEW.

The Tab key can be re-defined so that it generates a different character when pressed. This is done using *FX219,n – where n is the Ascii number of the new character.

For example, *FX219,65 will make Tab produce the letter A. If n is between 128 and 138 the string contained in the corresponding function key will be displayed, thus allowing Tab to produce more than one character.

Graphics programs

As part of my degree I am writing an educational package for mentally-handicapped children to be implemented on the BBC B.

As part of this project I need a number of short – 10 seconds – but interesting, graphics programs in order to reward the children for their actions.

If any of your readers thing they have a program which fits the bill, is non-copyright, and are willing to donate their listings free, both I and the children would be most grateful. – Paul Eccleson, School of Maths, Computing and Stats, James Went Building, The Polytechnic, Leicester LE1 9BH.

PS. This isn't an easy way to get a degree. I have the full permission of my tutor.

● Can any of our readers help Paul? You haven't let us down yet!

Hidden delay

ROBERT Booth, in July's Micromail, had a "cry from the heart" about the Tandy CGP printer.

I have the same printer and spent hours of confusion and fury before I discovered, in the manual – well hidden away: "The printer must have about ½ second delay after a VDU18 before graphics instruction is

set" (or words to that effect). That is:

```
VDU 1,18
TX=TIME:REPEAT UNTIL TIME)
TX+60
```

(since the time delay >0.6 seconds in fact).

Also, make sure graphic syntax is obeyed strictly or the printer hangs up – waiting for a comma or a 0 or something you know not.

Eventually it all works. – M.J. Carter, South Brent, Devon.

Basic ROM routine

I AM writing to tell you of a slight problem that may occur to disc users when using the Basic ROM print routines you gave in the February edition of The Micro User.

I used these in a machine code program that created a dump routine similar to MEDIT. I wrote it in basic assembler and when I called it, it worked fine.

I saved the object code to disc, so that it could be *RUN later on.

A few days later I tried to use the program to check a machine code control block. The program loaded yet only the Ascii dump was there. Yet when I called the routine from Basic both dumps were there.

The reason this happens is that when the DFS *RUNS machine code, it loads the file off the disc but is not "paged out" until the program has stopped. So any Basic ROM routines won't work as you are addressing the DFS.

The solution is to "page in" Basic thus:

● Find out which ROM socket contains Basic using FX/OSBYTE A=&BB(187).

● Then set locations &F4 and &FE30 to the number of the socket found above.

Once this is done you should have no problems. – Barry "Deadly" Wimlett, Faversham, Kent.

● We're sure many people have encountered the same problem.

Another quick way of reading the socket number containing the Basic ROM is to peek &24B

— this is what OSBYTE &BB does.

It's worth pointing out that you should turn interrupts off while poking the socket number into &F4 (currently selected ROM) and &FE30 (ROM latch).

So your routine should look like this:

```
SEI
LDA &24B
STA &F4
STA &FE30
CLI
```

'Legal' copying

LAST December, under the mistaken impression that it would use the same educational software as they were using at school, we purchased an Electron for our two children aged six and seven.

When we discovered that this was not the case, we changed it for a BBC B.

Having bought it as a Christmas present, we also purchased several commercial games tapes and it is these which are now causing us problems.

We recently added a disc system and have found it impossible to transfer the taped programs on to disc.

I understand that we would not be violating copyright laws if they are for our own use. Is there a way round this problem?

Also, if we were to purchase your monthly cassette tape — to save wear and tear on Mum's fingers — would we experience the same problem?

One final question. I understand from listening to more micro-wise users than myself that there is a code which you can type into the computer when playing arcade-type games which slows down the speed of the game for younger players.

Could you advise me on this code? — Mrs T.R. Malakouna, Enfield, Middlesex.

● Commercial software houses protect their tapes against "illegal" copying. Unfortunately this has the side-effect that it prevents "genuine" people making backup copies, or transferring them to disc. This

I HAVE just started writing my own assembly programs and thought the program below will be of use to other readers.

It allows you to turn the sound on and off by pressing the S — on — and Q — off keys.

This is achieved by using an interrupt driven routine which checks for S and Q each time a keyboard interrupt occurs. This means the program can be used while a Basic or a machine code program is running.

Once I'd finished the sound option I thought it would be a simple task to add a pause routine to the program. This is

what I did.

If you press P the micro will pause until O is pressed. Both of these facilities are useful for games which do not contain these options.

The routine can be disabled by entering *FX13,4 and enabled with *FX14,4.

You'll need to keep disabling the routine if you start debugging your program because each time you press P the micro will pause.

Once the program has been run the machine code will be automatically saved. You can now execute the routine by

entering either CALL&A18 or *RUN PCODE.

You should note that the routine may not work if it is being used with a program which uses events. This is because the program uses event 2 to trap each key pressed.

Thanks for a great mag and keep the disc utilities coming. — Brian Russell, Upton St. Leonards, Gloucester.

● We're sure our readers will find your routine very useful — we did. The pause routine is excellent for de-bugging programs or pausing in hair-raising situations in games.

```
10 son=ASC"S":soff=ASC"Q"
20 STARTX=&A18
30 p=ASC"P"
40 u=&C9
50 FOR X=0 TO 2 STEP 2
60 PX=STARTX
70 LOPT X
80 LDA#begin MOD 256
90 STA&220
100 LDA#begin DIV 256
110 STA&221
120 LDA#14
130 LDX#2
140 JSR&FFF4
150 RTS
160 .begin CPY#p
170 BEQpause
180 JMPsound
190 .pause
200 PHP:PHA:TXA:PHA:TYA:P
HA
210 .repeat
220 LDY#&FF
230 LDX#u
240 LDA#&81
250 JSR&FFF4
260 TYA
270 BEQrepeat
280 PLA:TYA:PLA:TXA:PLA:P
LP
290 RTS
300 .sound
310 PHP:PHA:TXA:PHA:TYA:P
HA
320 CPY#soff:BEQoff
330 CPY#son:BEQon
340 JMPfin
350 .off LDX#s1 MOD 256:L
DY#s1 DIV 256
360 JMPcad
370 .on LDX#s0 MOD 256:L
Y#s0 DIV 256
380 .cmd JSR&FFF7
390 .fin PLA:TYA:PLA:TXA:
PLA:PLP
400 RTS
410 .s1
420 .s0
430 !:s0=s1+8:NEXT
440 $s1="FX210,1"
450 $s0="FX210,0"
460 $SAVE"PCODE"A18 A80 A
18
```

we can do nothing about.

Our monthly cassettes are not protected as the listings are in the magazine anyway and people can learn from the listings — all Basic, not machine code.

We know of no generally effective code to slow down games. Occasionally someone will come up with a routine that, for a particular game that he has been able to access, will give extra lives, less speed and so on. But these are not standard.

There is a piece of hardware called Slomo from Nidd Valley Products, Stepping Stones House, Thistle Hill, Knaresborough, that will slow down

and even freeze any game.

There is also an article and listing in *The Micro User* December 1983, designed to slow down Basic programs and make them easier.

Maxi Mini

THANK you for Mini Office. The large print is the best I have so far come across.

However, I have to use the BBC Micro with a very large print display through an Epson HG.X.20 its RS232 and the RS423 of the micro.

In order to be able to use this, I have to give the following *FX commands: *FX8,6:*FX7,6;*FX3,5;*FX2,2.

If I do this before Chaining Mini Office, it will load and not run and of course there appears to be no way I can give these commands once the program is loaded.

Is there a way round this? — Michael Nyman, Birmingham.

● Database Software tells us that as yet it has no solution to getting Mini Office to work on a serial printer. If any of our readers have already solved the problem we'd be grateful for a solution.

MICROMAIL

HERE'S my answer to the problems of readers A.R. Dawson (Digamé por favor!, October 1984), Noreen Kennealy (French, with quite a lot of tears, April 1985), Jack Wheeler (Swedish characters, May 1985) and no doubt the many others out there who, like me, have been striving to produce satisfactory and reliable foreign-language characters directly from the BBC Micro keyboard.

Run the program below and the red function key f3 will produce an é.

```
10 *FX225,225:REM User
Guide pp.439,440
20 VDU23,228,8,16,60,102
,126,96,62,0:REM User Guide
pp. 170,171
```

However, anyone who has tried writing a foreign-language vocabulary test program has discovered that while it's easy enough to get the function keys to produce accented letters, the computer does not always recognise these letters and happily marks any answer with an accented letter in it,

Answer to those accents

WRONG! whether it is or not.

The computer turns accented letters in data into Basic keywords – but this is not the reason for the problem.

The computer stores user defined characters in a different page of memory – &C00 – to user defined function key definitions – &B00.

We have told the computer with a VDU23 statement that CHR\$228 is é. We have NOT defined key f3 to produce é – we have only told f3 to produce Ascii code 228.

It is not enough just to define CHR\$228, we must also define *KEY3.

There are two ways to add the necessary *KEY definition:

One is to type into the computer:

```
VDU 23,228,8,16,60,102,
126,96,62,0
```

and press Return.

Tell the computer to PRINT CHR\$228. An é will appear on the screen (except in Mode 7).

Use the Copy key to copy é into your program:

30 *KEY 3 é

Repeat the procedure for all the other accented characters you want the function keys to produce.

The other way is to type:

30 *KEY 3 !ld

(User Guide p.142 or Advanced User Guide p.16).

The !d is the equivalent of Ascii code 228. So this, in effect, defines key f3 to produce CHR\$228.

For the other Ascii codes needed for the function keys see User Guide p.490, or just copy the program below.

The routine can be put at the beginning of any program requiring foreign-language characters.

Once the program has been run the function keys can be used to include accented letters in data in your main program.

Accented letters in data will

still get changed into Basic keywords, but this doesn't matter, the computer still recognises them as accented letters and the function keys still produce accented letters.

The program will run in any mode except Mode 7.

Mode 6 is a good mode for entering program and data into the computer. If the Mode 6 black and white is a bit dull, try VDU19,2,4,0,0,0 to produce a blue screen with black lines on it – as BBC TV did in The Computer Programme – or choose any colour you like from User Guide pp.222-224.

Why not have a different colour for each language?

If your offspring learns French and German at school, a program to test his/her French vocabulary in German, or vice versa, kills two homeworks with one stone.

By changing the VDU23 numbers, the computer could be made to produce and recognise the entire Greek or Russian

```
10 REM ACCENTS by Joyce
Diamant
20 MODE6
30 *FX225,225
40 *FX226,235
50 *FX227,245
60 VDU23,225,16,8,60,6,6
2,102,62,0:*KEY0!!a
70 VDU23,226,24,36,60,6,
62,102,62,0:*KEY1!!b
80 VDU23,227,0,60,102,96
,102,60,8,24:*KEY2!!c
90 VDU23,228,8,16,60,102
,126,96,62,0:*KEY3!!d
100 VDU23,229,16,8,60,102
,126,96,62,0:*KEY4!!e
110 VDU23,230,24,36,60,10
```

```
2,126,96,60,0:*KEY5!!f
120 VDU23,231,24,36,56,24
,24,24,60,0:*KEY6!!g
130 VDU23,232,36,0,24,24,
24,24,24,0:*KEY7!!h
140 VDU23,233,24,36,60,10
2,102,102,60,0:*KEY8!!i
150 VDU23,234,16,8,102,10
2,102,102,62,0:*KEY9!!j
160 VDU23,235,32,16,0,24,
36,36,60,36:*KEY0!!k
170 VDU23,236,24,36,66,24
,36,36,60,36:*KEY1!!l
180 VDU23,237,120,196,192
,192,196,120,16,40:*KEY2!!m
190 VDU23,238,16,32,0,124
,64,120,64,120:*KEY3!!n
```

```
200 VDU23,239,32,16,0,124
,64,120,64,120:*KEY4!!o
210 VDU23,240,16,40,0,124
,64,120,64,124:*KEY5!!p
220 VDU23,241,56,60,60,72
,60,60,72,64:*KEY6!!q
230 VDU23,242,36,0,60,6,6
2,102,62,0:*KEY7!!r
240 VDU23,243,36,0,60,102
,102,102,60,0:*KEY8!!s
250 VDU23,244,36,0,102,10
2,102,102,62,0:*KEY9!!t
260 VDU23,245,4,8,60,6,62
,102,62,0:*KEY0!!u
270 VDU23,246,28,0,60,6,6
2,102,62,0:*KEY1!!v
280 VDU23,247,0,36,0,24,3
```

```
6,36,60,36:*KEY2!!w
290 VDU23,248,112,0,240,2
04,204,204,204,0:*KEY3!!x
300 VDU23,249,0,24,0,24,2
4,48,54,28:*KEY4!!y
310 VDU23,250,24,0,24,24,
24,24,24,0:*KEY5!!z
320 VDU23,251,8,16,56,24,
24,24,60,0:*KEY6!!{
330 VDU23,252,0,2,60,102,
82,102,124,120:*KEY7!!b1z
340 VDU23,253,4,8,60,102,
102,102,60,0:*KEY8!!}
350 VDU23,254,8,16,102,10
2,102,102,62,0:*KEY9!!~
```

Reader Joyce Diamant's program

CONTROL	â	ã	Ä	ñ	î	ï	ø	ó	ú
SHIFT	À	Ã	Ç	Ê	È	É	ä	õ	ü
	à	ã	ç	é	è	ê	ï	ô	ù

Function key string for accented characters

alphabet, or maybe even Arabic or Hindi.

The computer stores user defined characters and function key definitions in its memory below &E00, so there's no need to keep the definitions sitting in the program taking up precious memory.

*FX202,48 is a useful addition to the program. This turns the caps lock off, obliging the user to use lower case letters, which give a much better match to the accented letters than the capital letters do.

Bon chance! — Joyce Diment, Isleworth, Middlesex.

● We are very grateful for Mrs Diment's time and trouble in providing an excellent solution to this problem.

Cheaper back-ups

ANYONE changing from tape to disc will have gone through the struggle of transfer rewarded ultimately with the much faster load/save and so on — but will then have hit the drawback of expense when keeping backups.

Is there a program that will read files sequentially from disc and save — for backup — on to tape, preserving all load/execution addresses and so on, and a further program for the reverse procedure of getting the tape saved disc originals back on to tape? — D. Driver, Winscombe, Devon.

● You will find that Disc Doctor from Computer Concepts is all you need. It has two useful commands designed specifically for transferring files from tape to disc and vice-versa. It also includes other useful utilities such as a disc editor, disassembler and a "real-time" memory editor.

Software protection

I AM writing this letter in the hope that it will save quite a few people quite a lot of trouble.

As an owner of the UDM DDFS 2.00 I understood that the software protection used by

Acornsoft would be identical to that used with Elite.

With this in mind, I paid £17.65 for a copy of Revs only to find, to my horror, that it would not load.

I can understand the need for complicated software protection, but preventing a large number of potential customers from buying what is I'm sure is a very impressive simulator leaves me absolutely dumfounded.

To be fair, I am equally amazed by BBC-owners who are willing to use copies of games such as Elite and Revs, because they miss out on the entertaining and informative manuals that accompany the software.

Thank you for a most interesting magazine — no owner of a BBC Micro can afford to miss your monthly issue. — K.G. Medcalf, Croydon.

● Software compatibility with the various double density disc systems is a major problem. As the software protection increases, the compatibility decreases.

UDM have a new DDFS — 3.1 — which also doesn't work with Revs.

I'm afraid the protection will have to disappear before you'll have 100 per cent compatibility. The 8271 single density disc controller is capable of doing things that double density controllers cannot.

The better protection systems use these techniques to stop people copying the disc.

As far as we are aware there is no protected version of Revs which will work on your system.

Re-inked ribbons

REFERRING to the letter in your January issue regarding the non-availability of ribbons for the Seikosha GP80A Printer, I suggest that the writer re-inks his old ribbons.

This is simply done by removing the ribbon, prising off the lid of left hand plastic reel, holding the ribbon tightly to prevent its jumping out.

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From Page 157

liberally with Stephan's black metal stamp ink. This is available at most decent stationers but any oil-based printer's ink will do.

Eventually the ribbon will stretch, but the one used for this letter is on its fourth or fifth reincarnation. — O. Ormrod, Auckland, New Zealand.

LPRINT program

THANK you for the idea — in Programmer's Workshop, June

— of an equivalent for LPRINT for the BBC Micro.

After setting up the program you listed and after a few attempts with its use, it occurred to me that it was not the most useful way of achieving the desired end.

The short program I enclose achieves the end with only two key entries per line — *LINE requiring six with the use of the return key — and also has the desirable freedom to program the other function keys with suitable strings.

After the program has been entered and Run, f1 is pressed, the line of type entered, pressing

f2 will print the line, assuming that the printer is ready. — Dr Peter C. Russell, Burnham Overy Staith, Norfolk.

```
10 REM LPRINT equivalent
20 REM By Peter C. Russe
30 *KEY0 VDU2:P."
40 *KEY1 .":VDU1,127,1,1
50 REM Press f0, type te
60 REM then press f1
70 END
```

Clicking

PLEASE advise me about the problem of disc heads clicking when file handling — particularly with Wordwise.

I have been informed that the cause of the problem is the Acorn DFS which lifts the disc heads at each sector address.

Would you advise fitting of the DNFS for my configuration, and if so are there any side-effects in doing this? — Roger Hands, Tipton, West Midlands.

● We would not advise changing DFS for this reason.

And finally, with tongue firmly in cheek . . .

Cracking up in the belfry

Dear Trev,

Just a line to apologise for not sending you a postcard from my Scottish holiday. I would have, but my news needed to be hidden in a plain brown envelope and Andrea wouldn't give me the money to buy one. She said it might give me ideas.

We were staying near Loch Ness and things were going well until A. overheard me telling one of the locals that we were hoping for a sight of her famous relative.

After that she took away my copy of Mike Cook's autobiography, *Chips with Everything*.

A pity that, I was just up to the bit where he'd told the judge he wrote for Micro User.

Anyway, there I was, deep in the Great Glen — I swear I heard an American tourist say "It's a great glen. Imagine it, miles from anywhere, completely Beebless for two weeks. I used to watch Ceefax on the telly just to remind me of Mode 7.

However, the place wasn't utterly devoid of interest. Up the road from us was a Benedictine Abbey with its own set of bells. These appealed to A. so much that she decided to go along and see if she could pull one of the monks' peals for them.

I was so bored I decided to go along with her. She let me, on condition that "clanger" and "pull the other one" didn't pass my lips.

So off we went to the friary where Brother Derek took us round the belfry. He had an amazingly beatific sort of look that reminded me of Clive when he's actually bought some software.

"That was fascinating", I told Brother Derek at the end of the tour.

"I'm very glad", he replied. "Maybe you'll take it up as a hobby".

"I don't think so", I blurted out, visions of

whole evenings wasted playing around with Andrea filling my head, "it's all too complicated for me".

"Oh, no", he assured me, patting his tonsure innocently, "it's quite easy once you know the ropes".

At that we made our excuses and left. As we wearily wended our way westwards — I'm testing the W key — up the tree-lined drive, a strange, sad-looking little monk scurried across our path.

Something about his pathetic, frightened, misanthropic posture struck a chord.

"That face rings a bell", I said before I could stop myself. Ignoring A.'s disapproval, I manoeuvred for a better view.

"My God", I cried, forgetting where I was, "it's Barry Wood".

With that, the cowed scowler bounded off towards the monastery — but he wasn't quick enough. A. caught him by the cloisters.

"You are Barry Wood and I claim my free copy of 'Mikro ruser msprits 1938-85'", I told him as he struggled.

"All right, all right, it's me", the erstwhile Nigel Dempster of the Beeb admitted, "but we can't talk here".

With that he scurried off, telling us to follow him to his cell. And a poor barren room it was, devoid of any decoration except a "Bar Code Readers Are For Sheep" poster above his bunk and a picture of a madonna looking suspiciously like Robina Crow.

"Come on then, Barry", I asked him, "What are you doing here? The Beeb team have been looking for you everywhere".

"It was the pressure", the poor broken creature sobbed. "I was cracking up. At one point I found myself saying nice things

about Acorn. That's when I knew I needed a rest".

"But why here?" A. persisted.

"I saw an ad titled ABBEY weekend. In my state I thought it was A BBC weekend".

"But why did you stay?"

"I just got into the habit".

"But aren't there any micros?"

"No, not a one".

"And you don't get any micro magazines?"

"No. Just Acorn User. It's a form of penance", he added, seeing my face.

"Then you don't know about Acorn's troubles?"

"You mean the Electron?" he asked innocently.

At this point the conversation was interrupted by the ringing of the bell.

"I can't talk any more — that's the call for vespers. If I don't hurry I get a slow one".

"Well can I see you afterwards?" I asked.

"No, I've got to tour the monastery with our two new postulants, Brother Christopher and Brother Herman".

With that, he ushered us out.

I can still see him standing there in the gathering dust, giving us his blessing. At least, that's what A. says he was doing. I have my doubts.

I never saw him again, despite the fact that A. and I paid several visits to the bell tower.

But even out of sight, I was still aware of his presence. After all, who else could get the monks calling A. Esmerelda?

I know what that makes me, but, as you know, I've never been one to take the hump. Good old Brother Barry.

Yours,

Bob

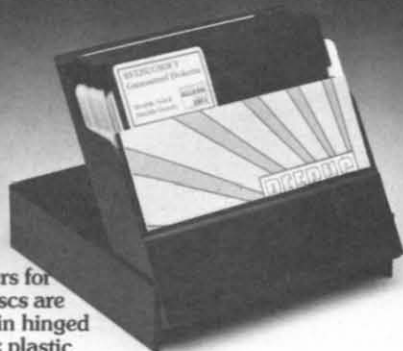
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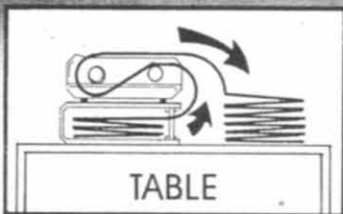
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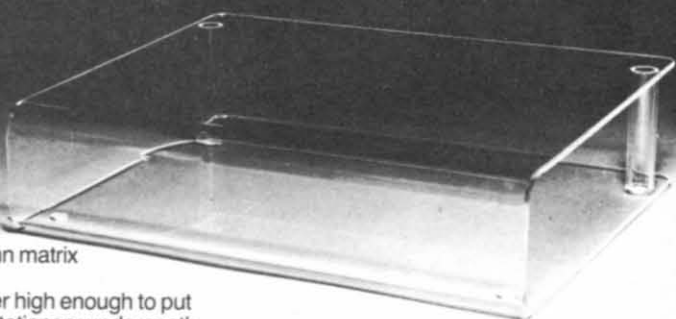


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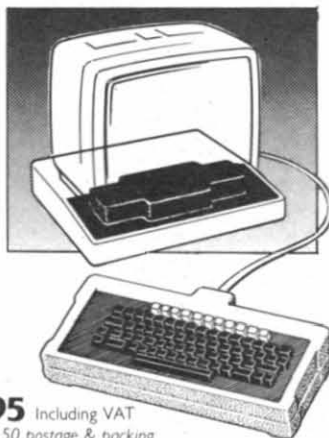
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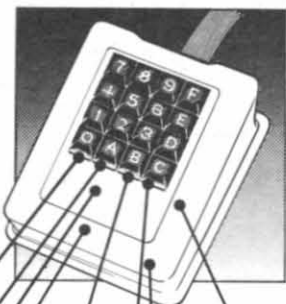
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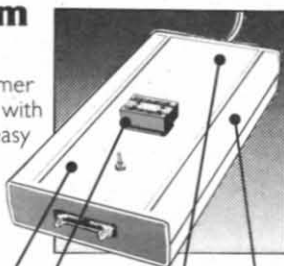
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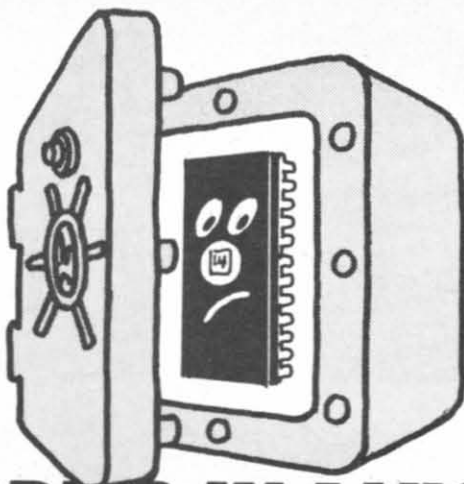
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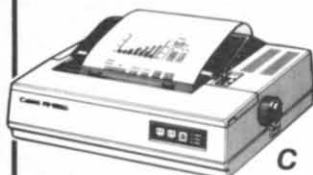


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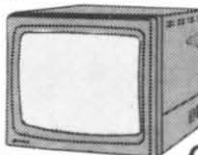
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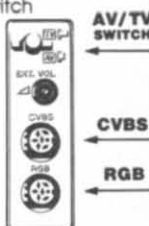


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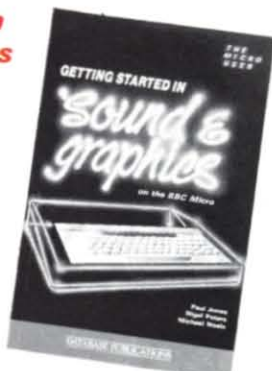
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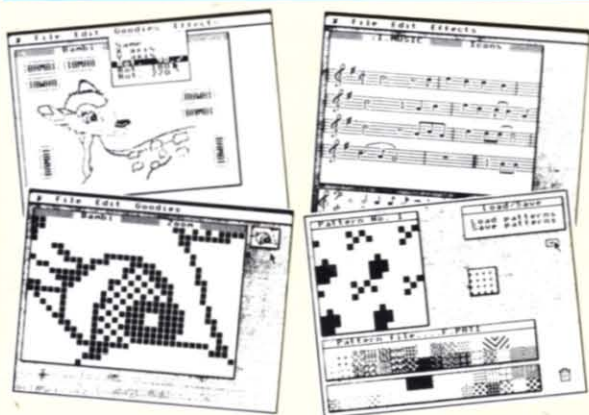
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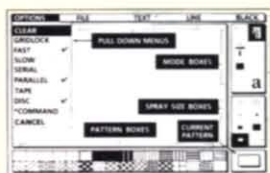
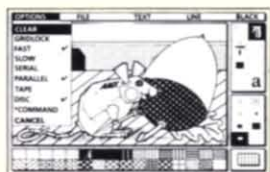
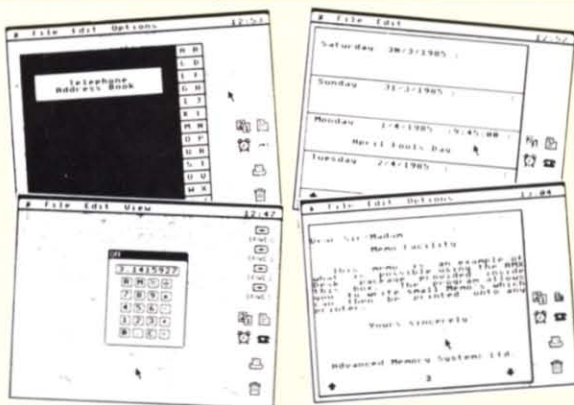
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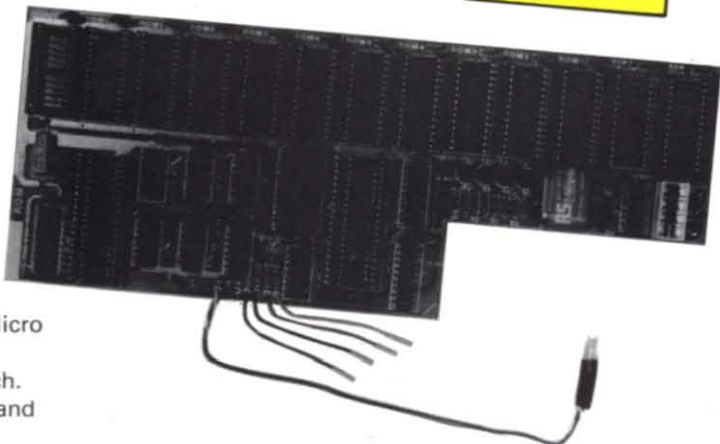
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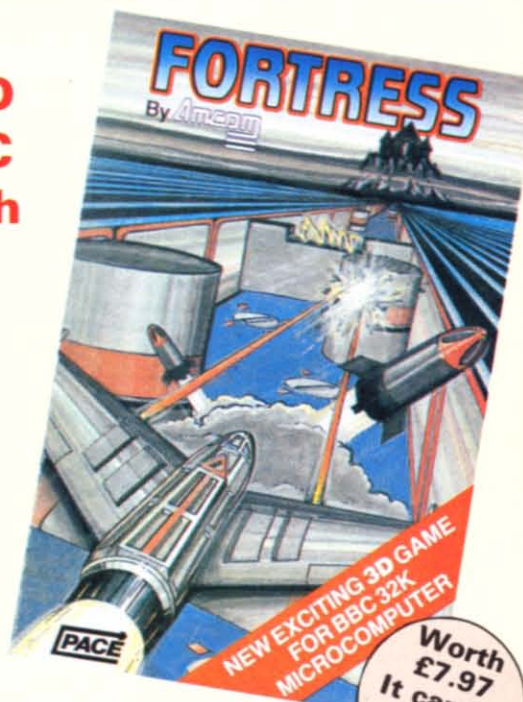
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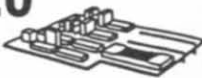
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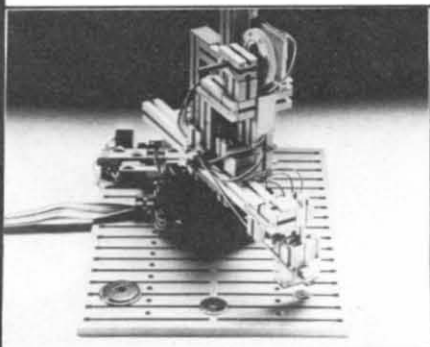
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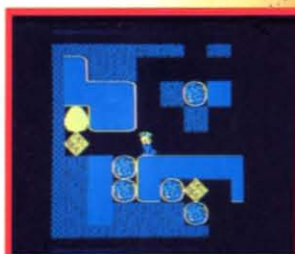
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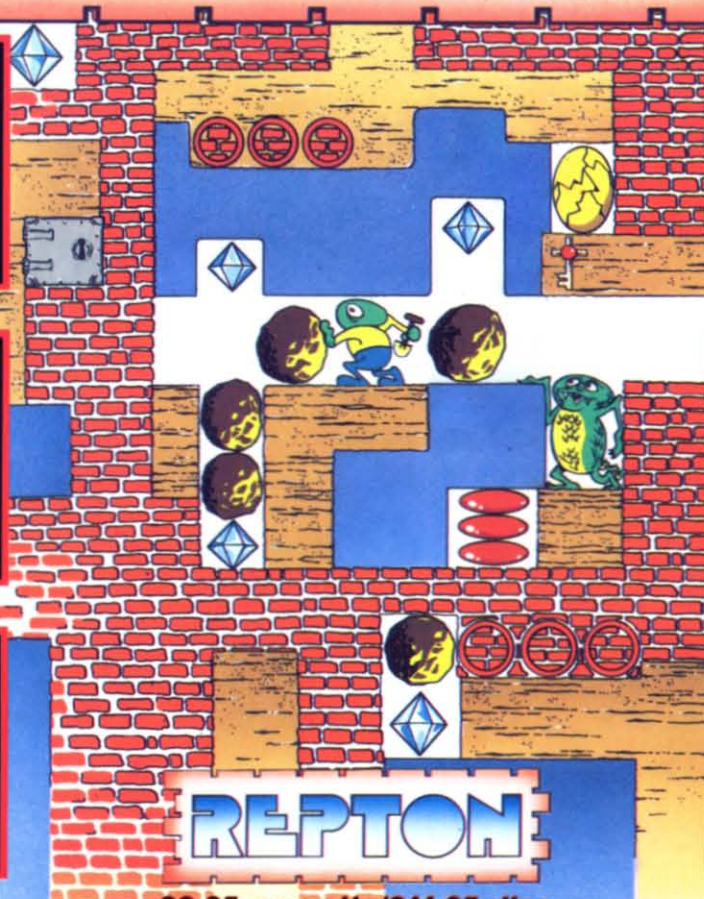
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AN EGG ABOUT TO HATCH



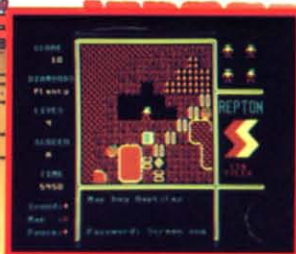
SCREEN 1



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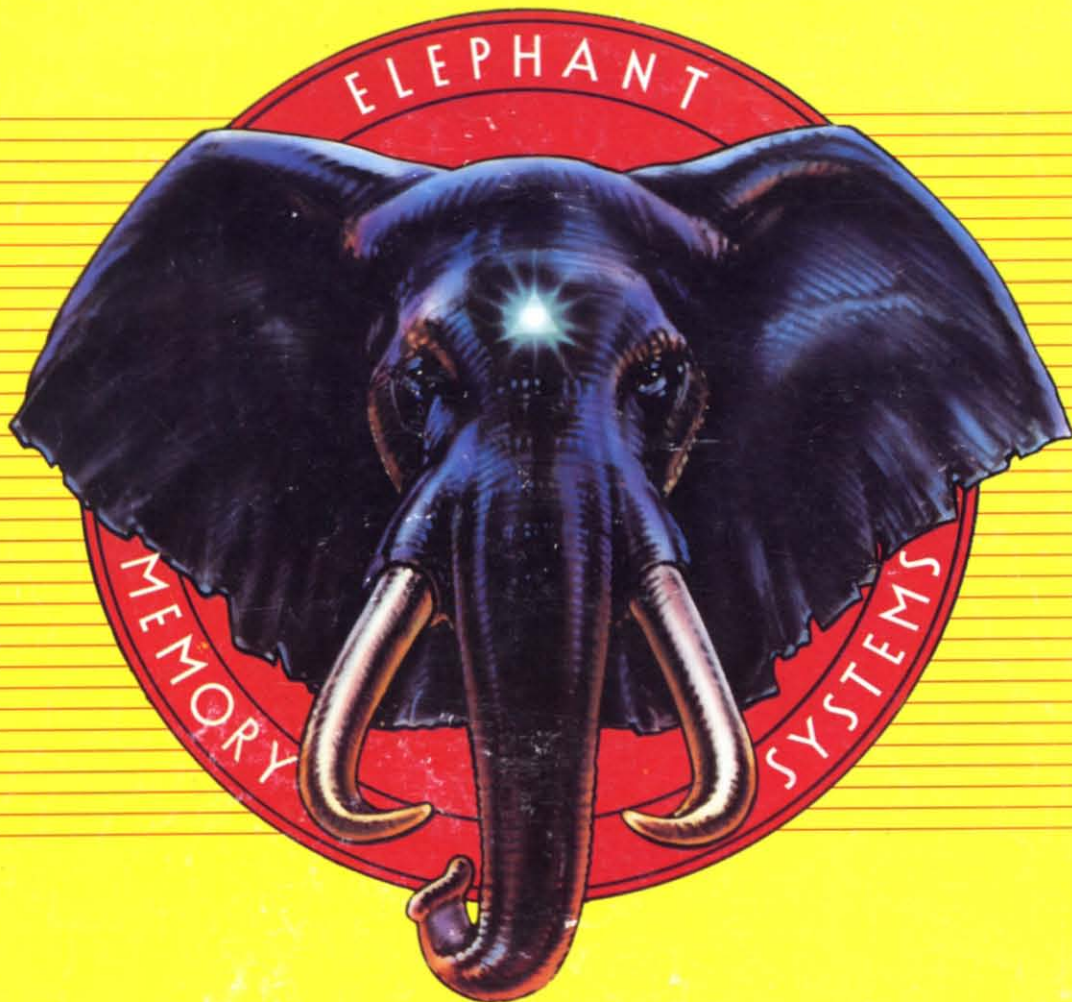


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